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BULLETINS  
of the  
NEW JERSEY  
AGRICULTURAL EXPERIMENT STATION

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BULLETINS  
295-303  
DIRECTOR'S  
REPORT 1916

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1916

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NEW BRUNSWICK, N. J.



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COMMERCIAL FEEDING STUFFS AND REGISTRATIONS  
FOR 1916

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NEW JERSEY

AGRICULTURAL

**Experiment Stations**

295

# NEW JERSEY AGRICULTURAL EXPERIMENT STATIONS.

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NEW JERSEY  
AGRICULTURAL EXPERIMENT STATIONS  
BULLETIN No. 295.

MAY 27, 1916.

**Commercial Feeding Stuffs and Registrations  
for 1916.**

By

CHARLES S. CATHCART, *State Chemist.\**

This bulletin contains the results of the third annual inspection of commercial feeding stuffs. The inspection was made under the authority of the law which was approved March 28th, 1912.

The Experiment Station is endeavoring to look after the interests of the consumers of feeding stuffs as well as the honest manufacturers of these materials, but in order to obtain the best results it is necessary that every dealer and consumer should co-operate. It is impossible to have an inspector present when every shipment is received and, consequently, the dealers and consumers should be familiar with the main requirements of the law. If materials are received which do not comply with the requirements, they should not be accepted and the state chemist should be informed regarding the shipment.

\*The chemical analyses were made by Ralph L. Willis, Samuel I. Hoddeson, Louis J. Kleinfeld and Archie C. Wark. The microscopical examinations were made by Joseph J. Williams.

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The full text of the law has been published several times and it does not seem necessary to repeat it at this time. The requirements that should be remembered, however, may be briefly stated as follows:

1. The material must be registered by the actual shipper (manufacturer or jobber).

2. The brand name, the guarantees for protein, fat and fiber, and (in mixed feeds) the specific name of each ingredient used in its manufacture must be stated.

3. The name and address of the actual shipper must be attached.

By insisting upon the above requirements the purchaser will not only be co-operating with the Experiment Station in the enforcement of the law, but may save himself some inconvenience should one of our inspectors find a feed that is not properly branded, since it will be necessary to have the matter attended to before the material can be sold.

The law under which this inspection was made is effective only in New Jersey, and the person selling cattle feeds in the state is the one responsible for fulfilling the requirements of the law. Many manufacturers assume these responsibilities in order to protect their various customers, as they realize the advantages to be gained by so doing.

During the past year the writer has received an appointment from the Federal Government as Commissioned State Official and is authorized to take samples of cattle feeds which enter into interstate commerce. Should deficient or adulterated feeds be located during our regular inspection, the information can be used for starting proceedings in the proper courts of the United States against the shipper. The advantage of the appointment is that the responsibility for the interstate shipments can be placed upon the shipper instead of upon the local dealer.

#### **Registrations.**

During the past year 518 manufacturers registered 2,582 brands of feeding stuffs which they intended to offer for sale in this state. Our inspectors found 118 brands that were being offered for sale before the required registrations had been made, and the dealers

holding these brands were notified not to dispose of the same until the requirements of the law had been complied with. Registrations were received later for 91 of these brands. The number of unregistered brands found last year was larger than reported above, and it is therefore quite evident that more attention is being given to this requirement.

From the reports rendered by the inspectors, it is noted that there are some manufacturers who do not state in the information attached to their products exactly the information which was registered. As it is absolutely necessary to have the two statements exactly the same—and these include the brand names, the guarantees for protein, fat and fiber and the specific names of the ingredients used in mixed feeds—great care should be used to accomplish this end. A brand that is registered with certain guarantees does not cover a material which carries a different guarantee, although the same brand name may be used.

The Feeding Stuffs law, as enacted three years ago, contained requirements that were new to the local dealers and consumers, and in order that everyone could become familiar with the requirements regarding the method of branding, some allowances have been made in the past. Inasmuch as everyone has been given sufficient opportunity to learn the method of procedure, it will be necessary in the future to have all deficient branding corrected before the sale of the material is approved.

#### Tonnage of Feeding Stuffs Sold.

The law requires reports to be filed on July 1st and January 1st of each year showing the tonnage of feeding stuffs sold during the preceding six months. The following is a summary of the reports received covering the sales made during 1913, 1914 and 1915:

Year.	July Reports.	January Reports.	Total for the Year.
1913.....	93,664.17	102,560.00	196,224.17
1914.....	88,192.50	114,508.73	202,701.23
1915.....	103,626.91	124,563.34	228,190.25

### **Inspection.**

During the inspection 1,467 samples were received, and of this number 49 were forwarded by individuals and the others were collected by the regular inspectors who visited every county in the state. The samples were secured in 166 cities and towns, and represented the stock of 333 dealers and consumers.

### **Examination.**

Each brand collected was examined microscopically, in order to determine the ingredients present. They were also examined by use of the official methods as adopted by the Association of Official Agricultural Chemists, in order to determine the content of protein, fat and fiber. The results as obtained by these two examinations are to be found in the tabulations on the following pages.

### **Results of the Inspection.**

The laboratory work of the inspection consisted of the examination of 1,151 samples, 49 of which, being unofficial samples, were reported directly to the party requesting the examination and are not included in the tabulations. Of the 1,102 official samples examined, 294 or 26.6 per cent. did not satisfy all of the guarantees given. The deficiencies due to the ingredients found are not included in the above figures. Last year the percentage of deficient samples was 17.7, which shows that there was a falling off in the grades of feeds furnished. It would be difficult to state the cause of this backward movement, but the fact remains that an unusually large number of shipments were deficient and, with two or three exceptions, were paid for at prices that were fixed for materials containing the guaranteed amounts of the nutrients.

The total number of deficiencies noted was protein 103, fat 103 and fiber 154. There were 233 samples deficient in one nutrient, 53 deficient in two nutrients and 7 deficient in the three nutrients. The percentage of samples that were found deficient in protein and fat is about the same as reported last year. There was a very large increase in the percentage of fiber deficiencies, and this increase

is sufficient to account for the poorer showing as found during this inspection.

The following tabulation is a summary of the inspection. It will be noted that the average composition and average selling prices of Calf Meals, Feed Mixtures and Poultry Foods are not given. These averages were not calculated on account of the variable character of the different brands reported under the respective headings. In preparing this tabulation the Protein as found is considered to satisfy its guarantee if it is not more than one per cent. below it. An allowance of one-half per cent. is also made for Fat and for the Fiber determinations.

## Summary of the Results of the Inspection.

Number of Guaranteed  
Samples Examined.

## FEEDING STUFF.

Alfalfa Meal .....	10
Blood Meal .....	1
Brewers' Dried Grains .....	17
Buckwheat Feed .....	4
Buckwheat Middlings .....	21
Buckwheat Offal .....	10
Calf Meals .....	7
Cocoanut Meal .....	2
Copra Cake Meal .....	1
Cottonseed Meal .....	21
Corn Bran .....	5
Corn Feed Meal .....	18
Corn Gluten Feed .....	17
Corn Gluten Meal .....	1
Corn and Cob Meal .....	28
Corn and Oats .....	36
Distillers' Grains—Corn .....	2
Distillers' Grains—Mixed .....	3
Dried Beet Pulp .....	3
Feeding Flour .....	12
Feed Mixtures .....	202
Fish Scrap .....	1
Hominy Meal and Feed .....	13
Linseed Oil Meal .....	12
Malt Sprouts .....	6
Meat Scrap .....	23
Oat Hulls .....	1
Peanut Oil Meal .....	4
Poultry Bone .....	2
Poultry Foods .....	294
Rye Bran .....	14
Rye Feed .....	1
Rye Middlings .....	17
Screenings—Corn .....	1
“ Flax .....	1
“ Malt .....	1
“ largely weed seeds .....	1
“ Wheat .....	1
Star Feed .....	2
Wheat Bran .....	90
Wheat Feed .....	7
Wheat Middlings .....	74
Wheat and Rye Middlings .....	2
Wheat Middlings and Maize Red Dog Flour .....	2

## Summary of the Results of the Inspection.

AVERAGE COMPOSITION.				Average Retail Selling Price Per Ton.	Number of Samples Satisfied Guarantees.	NUMBER OF SAMPLES DEFICIENT IN—					
Moisture.	Protein.	Fat.	Fiber.			Protein.	Fat.	Fiber.	One Nutrient.	Two Nutrients.	Three Nutrients.
%	%	%	%								
7.53	14.19	1.67	28.45	\$31.78	6	12		2	4		
9.29	83.94	0.26		*4.00					1		
6.48	29.62	6.54	13.83	29.25	9		1	5		1	
13.54	21.33	5.80	2.74	25.93	10				2		
12.30	29.26	7.86	3.88	29.00	15				3		
11.11	17.24	4.61	18.83	23.60	4	4		6	3	1	3
7.75	21.60	10.46	8.83	28.00	3			1	3		
8.19	21.75	7.54	10.25	39.00		1	1			1	
7.92	39.66	7.23	9.37	37.75	16	5	1	2	3	1	1
7.87	40.63	1.01	1.43		1						
11.76	8.86	4.17	1.84	33.22	12	1		4	5	1	
8.59	26.06	2.69	6.46	30.11	15		2		1		
7.83	10.49	7.37	6.98	27.40		5					
11.91	7.29	3.32	5.92	21.15	12	3	11	8	11	4	1
11.23	9.55	4.30	3.58	33.24	26	2	3	6	9	1	
6.32	33.28	10.37	10.26	34.50	1		1		1		
6.05	19.65	6.57	16.12	26.25	1		1		1		
8.74	8.42	0.71	19.06	27.25	3						
9.45	16.42	4.80	2.91	37.73	7	3	2	1	4	1	
8.47	49.81	1.99		*3.25	214	22	25	49	60	18	
8.67	11.27	7.72	3.96	31.73	13						
8.91	32.16	5.64	8.20	43.38	8	4			4		
7.17	26.33	1.16	12.76	28.17	2	2	3	1	3		1
6.65	49.09	14.15		57.30	12	10	2		10	1	
5.64	3.06	1.13	30.45					1	1		
7.44	38.14	10.26	6.78	34.50	2	1		1	2		
7.41	24.97	1.34		52.33		2	2		1		
10.84	13.79	2.67	4.30	26.33	238	20	24	24	44	12	
11.62	13.13	2.67	3.59	32.00	8		3	3	6		
12.04	12.18	2.41	2.48	30.94	10		1	6	7		
10.10	10.50	9.14	2.70								
8.84	11.06	6.82	21.02					1	1		
12.20	23.56	1.41	10.66	28.00	1						
8.57	17.06	13.27	9.54								
10.54	14.13	2.25	5.53								
7.30	8.97	7.05	10.34	29.00							
8.79	15.02	4.52	9.35	28.16	67	6	5	19	17	5	1
9.26	15.46	4.69	7.65	28.58	5			2	2		
9.71	15.86	4.87	5.00	33.11	55	7	6	8	15	3	
9.47	14.66	5.07	5.51	36.00							
8.28	12.60	7.20	4.30	31.50	2						

\* Average selling price per cwt.

**COTTONSEED MEAL.**

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.	PROTEIN.		FAT.		FIBER.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
160295	American Milling Co., Peoria, Ill.	Hightstown	6.57	40.31	41.00	6.80	6.50	9.12	10.00
16441	Amco Cottonseed Meal..... M. F. Baringer, Philadelphia, Pa.	Wyckoff	7.07	40.88	38.62	7.93	6.00	9.41	10.00
16077	M. F. B. Prime Cottonseed Meal..... F. W. Brode & Co., Memphis, Tenn.	Camden	8.13	41.56	41.00	7.53	6.00	8.74	10.00
16931	Owl Brand H. G. Cottonseed Meal.....	Somerville	6.65	39.38	41.00	5.90	6.00	10.28	10.00
16725	Owl Brand H. G. Cottonseed Meal.....	Morristown	11.08	40.31	41.00	6.48	6.00	8.62	10.00
160196	Buckeye Cotton Oil Co., Cincinnati, O. Buckeye Prime Cottonseed Meal.....	Salem	8.16	38.44	38.62	7.74	6.00	9.90	12.00
16031	S. P. Davis, Little Rock, Ark. Good Luck Brand Cottonseed Meal.....	Camden	8.10	44.75	41.00	7.31	7.00	6.59	9.00
160118	Good Luck Brand Cottonseed Meal.....	Flemington	6.97	42.88	41.00	8.01	7.00	6.68	9.00
160248	Humphreys-Godwin Co., Memphis, Tenn. Forfat Brand Cottonseed Meal.....	Bridgeton	8.29	33.81	38.62	5.14	6.00	14.54	12.00
16050	Lanier Bros., Nashville, Tenn. Canary Brand H. G. Cottonseed Meal.....	Red Bank	8.52	40.00	41.00	7.10	6.00	8.40	10.00
16887	J. M. Macdonald, Cincinnati, O. Kineda Prime Cottonseed Meal.....	Gladstone	8.23	39.25	38.60	6.81	6.00	8.97	12.00
16898	Macado Cottonseed Meal.....	Bound Brook	8.04	40.25	41.00	7.83	6.00	8.34	12.00
160364	C. L. Montgomery & Co., Memphis, Tenn. Canary Extra Brand Choice Cottonseed Meal.....	Camden	7.30	40.94	41.00	8.81	6.00	8.16	10.00
16188	W. C. Nothern, Little Rock, Ark. Bee Brand Cottonseed Meal.....	Old Bridge	8.88	40.81	41.00	6.42	6.00	9.33	10.00
16006	Ralston-Purina Co., St. Louis, Mo. Winner Prime Cottonseed Meal.....	Medford	8.57	36.50	38.62	7.66	6.00	11.94	12.00
16055	Winner Prime Cottonseed Meal.....	Red Bank	8.79	37.75	38.62	6.40	6.00	11.05	12.00
160082	Geo. B. Robinson, Jr., New York City. Robin Brand Cottonseed Meal.....	Titusville	7.90	36.00	41.00	8.36	6.00	9.76	10.00
16466	Robin Brand Cottonseed Meal.....	Elizabeth	6.13	34.88	41.00	6.43	6.00	12.90	10.00
16775	W. Newton Smith, Baltimore, Md. Dirigo Brand Cottonseed Meal.....	Dover	6.95	41.44	38.62	8.43	7.00	9.52	10.50
16899	Texas Cattle and Linter Co., Dallas, Texas. Texoma Brand Choice Cottonseed Meal.....	Bound Brook	8.59	40.94	41.00	6.78	6.00	8.00	10.00
16899	Union Brokerage & Commission Co., Vicksburg, Miss. Durjan Brand Cottonseed Meal.....	Lafayette	7.45	41.81	41.00	7.80	7.50	6.45	16.00
	Average.....		7.92	39.66	.....	7.23	.....	9.37	.....

## OIL (LINSEED) MEAL.

	American Linseed Co., New York City.								
16114	Old Process Linseed Oil Meal.....	Moorestown .....	8.68	31.06	34.00	5.54	5.00	8.31	8.00
16052	Old Process Linseed Oil Meal.....	Red Bank .....	8.86	36.19	34.00	5.10	5.00	7.29	8.00
16492	Hydro Pure Linseed Meal.....	Newark .....	9.13	37.06	36.00	2.43	2.00	8.02	9.00
16867	Hydro Pure Linseed Meal.....	Far Hills .....	9.25	36.75	36.00	2.29	2.00	7.89	9.00
	American Milling Co., Peoria, Ill.								
160362	Amco Old Process Linseed Meal.....	Camden .....	9.22	29.06	30.00	6.45	5.00	8.65	10.00
160388	Amco Old Process Linseed Meal.....	Camden .....	9.25	28.69	30.00	6.80	5.00	9.14	10.00
	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.								
16397	Pure Old Process Oil Meal.....	Homestead .....	8.57	31.38	33.00	5.82	5.00	8.55	10.00
	Kelloggs & Miller, Amsterdam, N. Y.								
16880	Old Process Oil Meal.....	Gladstone .....	9.42	30.06	31.00	6.54	4.00	8.51	9.00
16514	Metzger Seed and Oil Co., Toledo, O.	Passaic .....	8.57	35.56	30.00	6.39	5.00	7.44	10.00
16388	Midland Linseed Products Co., Minneapolis, Minn.	Fort Lee .....	8.95	30.75	32.00	6.60	5.00	7.79	9.50
	Midland Linseed Products Ground Linseed Cake.....								
16686	Toledo Seed and Oil Co., Toledo, O.	Maplewood .....	8.71	29.31	30.00	6.75	5.00	8.32	10.00
16142	Old Process Oil Meal.....	Manasquan .....	8.26	30.06	30.00	6.92	5.00	8.51	10.00
	Old Process Oil Meal.....		8.91	32.16		5.64		8.20	
	Average .....								

## CORN GLUTEN FEED.

	American Maize Products Co., New York City.								
16782	Cream of Corn Gluten Feed.....	Rockaway .....	8.48	25.94	23.00	1.80	2.50	5.91	8.50
16302	Clinton Sugar Refinery, Clinton, Iowa.	Pennington .....	7.33	28.88	23.00	3.32	3.00	5.95	8.00
160180	Clinton Corn Gluten Feed.....	Woodstock .....	9.02	26.31	23.00	3.33	3.00	6.95	8.00
160086	Clinton Corn Gluten Feed.....	Lambertville .....	8.65	26.56	23.00	3.10	3.00	7.48	8.00
	Corn Products Refining Co., New York City.								
16137	Buffalo Corn Gluten Feed.....	Freehold .....	11.28	24.56	23.00	2.51	1.00	5.83	8.50
16223	Buffalo Corn Gluten Feed.....	Burlington .....	7.66	28.75	23.00	2.69	1.00	7.01	8.50
16580	Buffalo Corn Gluten Feed.....	Paterson .....	8.10	26.44	23.00	3.36	1.00	7.76	8.50
160139	Buffalo Corn Gluten Feed.....	Trenton .....	7.93	24.31	23.00	3.28	1.00	7.26	8.50
16172	Globe Corn Gluten Feed.....	Jamesburg .....	9.09	27.63	23.00	4.30	1.00	5.09	8.50
16664	Globe Corn Gluten Feed.....	Hamburg .....	7.67	27.50	23.00	1.68	1.00	6.05	8.50
16966	Globe Corn Gluten Feed.....	Vall .....	9.08	23.88	23.00	2.27	1.00	6.90	8.50
	Douglas Co., Cedar Rapids, Iowa.								
16046	Douglas Corn Gluten Feed.....	Red Bank .....	9.52	26.19	23.00	1.83	2.00	6.97	8.00
16724	Douglas Corn Gluten Feed.....	Morristown .....	8.81	26.88	23.00	1.54	1.00	5.79	8.00
	Piel Bros. Starch Co., Indianapolis, Ind.								
16084	P. Bros. Corn Gluten Feed.....	Camden .....	7.74	25.19	25.00	2.17	2.00	6.61	8.00
16897	P. Bros. Corn Gluten Feed.....	Bound Brook .....	6.87	24.31	23.00	2.20	2.00	6.57	8.00
	Rosekrans-Snyder Co., Philadelphia, Pa.								
16656	Jenkins' Corn Gluten Feed.....	Vernon .....	8.14	25.63	22.00	2.14	3.00	5.57	8.00
	C. W. Wagar & Co., Philadelphia, Pa.								
160087	Union Corn Gluten Feed.....	Stockton .....	10.58	24.00	23.00	4.22	3.00	6.18	8.00
	Average .....		8.59	26.06		2.69		6.46	

# CORN GLUTEN MEAL.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	PROTEIN.		FAT.		FIBER.	
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
16777	Corn Products Refining Co., New York City. Diamond Corn Gluten Meal	Dover	40.63	40.00	1.01	1.50	1.43	4.00

## HOMINY MEAL AND FEED.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	PROTEIN.		FAT.		FIBER.	
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
16572	American Hominy Co., Indianapolis, Ind.	Little Falls	12.00	9.50	9.63	7.00	4.38	7.00
16745	Homco Feed	Branchville	11.44	9.50	9.06	7.00	4.45	7.00
16824	M. F. Baringer, Philadelphia, Pa.	Flanders	10.25	9.00	6.76	6.00	3.44	10.00
16553	Buffalo Cereal Co., Buffalo, N. Y.	Passaic	12.56	10.00	6.96	6.00	3.78	5.00
16399	Empire Grain and Elevator Co., Binghamton, N. Y.	Campgaw	11.75	10.00	7.70	7.00	4.86	6.06
16284	Pearl Hominy	Hopewell	12.13	10.00	10.08	7.50	3.97	7.00
16006	Evans Milling Co., Indianapolis, Ind.	Marlshoro	12.81	10.00	7.66	6.00	3.66	6.00
16557	Chas. A. Krause Milling Co., Milwaukee, Wis.	Passaic	12.50	10.00	8.24	6.00	5.44	5.00
16672	Badger Hominy Feed.	Hamburg	11.31	10.00	6.69	5.00	4.45	5.00
16301	Miner-Hillard Milling Co., Wilkesbarre, Pa.	Pennington	10.81	10.00	7.20	6.00	4.71	5.00
16705	Patent Cereals Co., Geneva, N. Y.	Sussex	10.75	9.00	8.00	4.00	3.18	4.00
160414	Hominy Feed	Plainsboro	10.13		7.91		4.06	
16397	Quaker Oats Co., Chicago, Ill.	Lafayette	9.63	10.00	7.01	7.00	3.04	4.75
16438	J. E. Soper & Co., Boston, Mass.	Wyckoff	9.00	7.00	7.23	5.50	10.96	12.50
16642	Thompson & Mould, Goshen, N. Y.	Paterson	8.94	7.00	6.87	5.50	9.71	12.50
160013	Toledo Elevator, Indianapolis, Ind.	Frenchtown	9.75	8.00	5.20	3.00	2.00	8.00
	*Star Feed	Average	11.27		7.72		3.96	
	*Star Feed							
	Walters Milling Co., Philadelphia, Pa.							
	White Hominy Feed							

\* Ingredients—Hominy feed, ground corn cob and salt. Not included in the averages.

## BREWERS' DRIED GRAINS.

16003	Atlantic Export Co., New York City.	Newark	7.04	31.44	25.00	6.05	5.50	12.17	14.00
	Dr. Spaulding's Dried Brewers' Grains.								
16006	M. F. Baringer, Philadelphia, Pa.	Hamburg	7.56	25.69	25.00	6.65	6.00	14.69	15.00
16712	Crown Brewers' Dried Grains.	Sussex	6.72	28.38	25.00	6.24	5.00	13.04	15.00
16967	Crown Brewers' Dried Grains.	Hope	7.54	32.25	25.00	7.00	5.00	10.51	15.00
16001	Farmers Feed Co., New York City.	Belle Mead	7.13	24.44	27.20	7.30	6.30	15.38	15.20
16278	Bull Brand Dried Brewers' Grains.	Princeton Junction	4.38	30.19	27.20	6.69	6.30	13.61	15.20
16126	J. C. Klander Est., Philadelphia, Pa.	Camden	5.93	25.75	26.00	6.91	6.00	13.32	15.00
160250	Dried Brewers' Grains.	Bridgeport	5.52	27.25	26.00	7.25	6.00	12.46	15.00
16007	G. Krueger Brewing Co., Newark, N. J.	Caldwell	5.38	25.19	23.98	7.54	6.89	12.87	12.02
16022	Penn. Grains and Feed Co., Philadelphia, Pa.	Camden	7.82	25.00	26.00	6.25	6.00	13.62	12.00
160393	Penngrains Brewers' Dried Grains.	Williamstown	7.07	25.50	26.00	6.34	6.00	14.63	12.00
16127	Rosekrans-Snyder Co., Philadelphia, Pa.	Camden	5.74	23.56	25.00	6.49	5.00	15.21	18.00
160014	Pilsner Dried Brewers' Grains.	Somerville	6.88	28.63	25.00	5.71	5.00	13.93	18.00
16700	C. W. Wagar & Co., Philadelphia, Pa.	Sussex	7.27	26.88	26.00	5.47	6.00	14.95	16.00
	Schlitz Purity Dried Grains.								
16219	Walters Milling Co., Philadelphia, Pa.	Mt. Holly	4.77	24.06	21.00	6.27	4.00	14.23	18.00
16177	Western Grains and Feed Co., Chicago, Ill.	Jamesburg	6.43	18.19	25.00	8.74	5.00	17.67	16.00
16798	*Milkmaid Dried Brewers' Grains.	Millington	6.95	21.69	20.00	6.46	5.00	16.66	16.00
	Dried Brewers' Grains.								
	Average		6.48	26.62		6.54		13.83	

\* Contained corn distillers' grains. Not included in the average.

## DISTILLERS' DRIED GRAINS.

16272	Chapin & Co., Hammond, Ind.	Hopewell	6.16	34.25	30.00	10.13	11.00	9.95	14.00
16390	Alax Flakes (mainly from corn)	Somerville	6.48	32.31	30.00	10.60	11.00	10.57	14.00
16652	M. F. Baringer, Philadelphia, Pa.	Sussex	6.20	19.13	20.00	6.16	6.00	17.82	18.00
16760	<sup>1</sup> Atlantic Grains	Newton	6.41	19.94	19.00	7.10	7.00	13.97	19.00
	<sup>2</sup> Ivy Grains								
16707	J. A. Howell, Middletown, N. Y.	Sussex	5.53	19.88	20.00	6.44	7.00	16.56	19.00
	<sup>3</sup> Fleischmann's Dried Grains.								

<sup>1</sup> Ingredients—Corn, rye, barley and malt sprouts.<sup>2</sup> Ingredients—Corn, barley, malt sprouts and small amount of screenings.<sup>3</sup> Ingredients—Corn, rye, barley and malt sprouts.

## MALT SPROUTS.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.	PROTEIN.		FAT.		FIBER.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
16150	American Malting Co., New York City.	Freehold	6.83	19.44	21.09	2.22	2.10	8.09	12.30
160028	Standard Malt Sprouts.	Somerville	8.90	25.50	21.09	0.89	2.10	11.86	12.30
160116	M. F. Baringer, Philadelphia, Pa.	Flemington	7.62	23.19	25.00	1.01	1.60	15.47	13.00
160099	Farmers Feed Co., New York City.	Three Bridges	6.50	26.94	26.06	1.58	1.57	11.85	12.95
16300	Penn Grains and Feed Co., Philadelphia, Pa.	Pennington	6.84	29.44	28.76	0.99	1.53	11.75	12.06
160029	Perot Malting Co., Buffalo, N. Y.	Frenchtown	7.70	25.75	22.00	1.07	0.50	11.96	18.00
	3 Malt Sprouts		7.17	26.33		1.16		12.76	
	Average								

<sup>1</sup> Malt screenings consisting largely of barley hulls and malted barley. Not included in the averages.

<sup>2</sup> Contained malted barley, barley hulls and weed seeds. Not included in the average.

<sup>3</sup> Contained 2% of barley hulls.

## MALT SCREENINGS.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.	PROTEIN.		FAT.		FIBER.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
16058	P. Ballantine & Sons, Newark, N. J.	Keel Bank	12.20	23.56	15.40	1.41	1.08	10.66	17.23
	1 Malt Screenings								

<sup>1</sup> Malt sprouts, barley hulls and small amount of weed seeds.

## WHEAT BRAN.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.	PROTEIN.		FAT.		FIBER.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
160022	W. N. Adair & Co., Raritan, N. J.	Raritan	9.14	14.63	11.50	3.79	4.00	7.20	8.00
160161	C. C. Avis, Woodstown, N. J.	Woodstown	10.79	14.31	13.00	3.99	4.00	8.31	10.00
16115	M. F. Baringer, Philadelphia, Pa.	Moorestown	9.74	15.44	15.00	4.42	4.50	8.05	12.00
16891	Pure Wheat Bran.	Belvidere	8.44	13.75	13.00	5.46	4.00	10.07	13.00
16702	Trenton Milling Co.'s Pure Winter Wheat Bran.	Lafayette	8.07	15.81	14.00	3.81	3.50	9.57	10.00
160232	E. Boone & Johnson Bros., Bridgeton, N. J.	Bridgeton	8.65	14.63	14.44	3.90	5.53	9.35	8.50
16256	Geo. C. Christian & Co., Minneapolis, Minn.	Metuchen	6.48	12.81	13.00	4.85	4.00	11.74	12.00
	1 Jersey Wheat Bran.								

<sup>1</sup> With ground screenings not exceeding mill run.

## WHEAT BRAN—Continued.

160095	L. Christian & Co., Minneapolis, Minn.	Flemington	8.42	14.13	15.00	4.26	4.00	11.06	10.00
	Marchless Wheat Bran.								
160036	The Cleveland Milling Co., Cleveland, O.	Frenchtown	8.05	13.75	14.00	4.74	4.50	9.74	12.00
160050	Spring Wheat Bran.	Clinton	9.50	16.00	13.00	4.65	4.00	7.52	8.25
	The Clinton Mills, Clinton, N. J.								
160234	The Cockley Milling Co., Lexington, O.	Bridgeton	9.55	13.19	15.20	3.80	4.40	10.27	9.00
	Wheat Bran								
16553	Commander Mill Co., Minneapolis, Minn.	Issaia	8.66	13.75	14.00	4.45	4.00	10.64	11.00
	Commander Wheat Bran.								
16610	William G. Crocker, Minneapolis, Minn.	Caldwell	8.04	13.44	14.50	5.47	4.00	10.48	12.06
	Wheat Bran								
16390	J. G. Davis Co., Rochester, N. Y.	Dumont	8.35	14.06	14.00	5.44	3.00	9.89	12.00
	Choice Wheat Bran.								
16198	Duluth-Superior Milling Co., Duluth, Minn.	Jamesburg	7.85	15.00	15.00	4.78	4.00	10.53	11.25
	Duluth Imperial Bran								
16178	Eagle Roller Mill Co., New Ulm, Minn.	Spotswood	8.57	13.75	14.00	4.75	3.40	10.16	11.00
16783	Wheat Bran	Dover	7.84	14.13	14.00	4.51	3.40	11.18	11.00
	Wheat Bran								
160205	B. A. Eckhart Milling Co., Chicago, Ill.	Bridgeton	8.70	13.81	14.00	5.20	4.00	9.92	11.00
160214	Everham & Burtis, Allentown, N. J.	Allentown	9.30	13.19	12.00	3.30	4.00	9.27	7.00
	Everett, Anglenbaugh & Co., Waseca, Minn.								
16261	Paico Wheat Bran	New Brunswick	8.03	15.94	14.00	5.31	3.00	9.68	12.00
160191	Ewen Milling Co., Alloway, N. J.	Alloway	8.95	13.94	13.25	4.03	4.25	10.27	7.56
160073	Flemington Milling Co., Flemington, N. J.	Flemington	9.19	14.63	12.50	3.84	3.74	9.56	9.26
	Flory Milling Co., Bangor, Pa.								
16961	Pure Wheat Bran.	Hope	8.36	15.31	12.00	4.26	3.00	9.68	9.00
16876	T. D. Fritch & Sons, Bethlehem, Pa.	Pottersville	8.94	15.81	12.00	3.94	3.00	8.19	12.00
	C. A. Gambrill Mfg. Co., Baltimore, Md.								
16323	Patapsco Wheat Bran.	Trenton	7.91	14.25	14.50	5.78	4.00	8.74	9.50
160227	G. F. Geisinger, Bridgeton, N. J.	Bridgeton	9.91	15.56	14.44	3.55	4.23	7.89	7.25
16010	J. H. Grover & Son, Princeton Junction, N. J.	Princeton Junction	9.99	14.50	13.50	5.00	3.50	10.45	12.00
16280	Gwin, Milling Co., Columbus, O.	Hopewell	8.38	14.94	15.00	4.16	4.00	10.21	8.00
16004	Hecker-Jones-Jewell Milling Co., Buffalo, N. Y.	Newark	10.84	14.31	15.00	5.54	3.50	10.35	11.75
	Choice Wheat Bran with trace of screenings.								
16374	Hecker-Jones-Jewell Milling Co., New York City.	Plainfield	8.40	15.81	14.50	4.37	4.00	8.41	11.00
160105	Choice Wheat Bran with trace of screenings.	Three Bridges	9.39	14.56	14.00	3.80	4.00	8.66	3.00
160019	Geo. C. Higgins & Son, Three Bridges, N. J.	South Branch	8.98	13.50	11.50	4.02	4.00	8.94	8.00
16110	August Hippie, South Branch, N. J.	Moorestown	9.90	14.56	13.20	4.23	4.00	8.24	8.00
	J. C. Hopkins, Jr., Moorestown, N. J.								
16401	Hunter-Robinson-Wenz Milling Co., St. Louis, Mo.	Campaw	7.85	17.63	15.50	4.31	4.00	7.28	11.00
	Headnaught Extra Course Wheat Bran.	Trenton	9.40	13.81	14.00	5.02	4.00	9.87	10.00
160145	E. C. Hutchinson Milling Co., Trenton, N. J.								

<sup>1</sup> With ground screenings not exceeding mill run.<sup>2</sup> With ground screenings not exceeding mill run. Also contained 10% oat hulls.

## WHEAT BRAN—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.		PROTEIN.		FAT.		FIBER.	
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
160246	W. J. Jennison Co., Minneapolis, Minn.	New Egypt	13.75	15.00	4.89	4.00	9.91	10.00	10.00	
160191	Wheat Bran	Spotswood	13.63	15.00	4.27	4.00	13.70	10.00	10.00	
160187	W. W. Johnson, Elmer, N. J.	Elmer	15.81	12.69	3.58	2.90	9.38	8.10	8.10	
160200	R. S. Johnson, Bridgeton, N. J.	Bridgeton	14.31	13.56	4.21	4.30	8.71	8.92	8.92	
160370	H. S. Justice & Co., Fredricktown, N. J.	Pedricktown	14.44	13.39	4.38	4.49	8.21	7.61	7.61	
16304	The Kansas Flour Mills Co., Kansas City, Mo.	Pennington	16.25	14.70	4.32	4.45	9.41	10.00	10.00	
16304	Wheat Bran and Screenings.									
16304	Kansas Milling Co., Wichita, Kansas.									
16102	Wheat Bran	Red Bank	18.06	15.50	4.60	3.50	8.22	8.50	8.50	
16007	Kemper Mill and Elevator Co., Kansas City, Mo.	Mt. Holly	17.56	14.50	5.16	4.00	8.30	10.00	10.00	
16806	Anchor Bran	Bernardsville	7.42	17.94	4.00	4.92	10.03	10.00	10.00	
160157	Diamond K Bran	Trenton	16.56	14.50	4.08	4.00	8.18	10.00	10.00	
16063	Keusch & Schwartz Co., New York City.	Paterson	15.00	14.50	4.55	4.00	10.39	12.00	12.00	
160331	Kirby Bros., Medford, N. J.	Medford	9.12	14.38	4.12	4.00	7.57	9.00	9.00	
160218	Geo. H. Kirby, Allentown, N. J.	Allentown	8.59	14.44	3.99	4.53	6.76	6.71	6.71	
160169	Listman Mill Co., La Crosse, Wis.	Woodstown	8.95	14.44	5.21	3.86	8.79	12.16	12.16	
160183	Elmco Fancy Wheat Bran.									
160183	Mansfield Milling Co., Mansfield, O.	Salem	13.81	13.00	6.03	4.00	9.62	13.00	13.00	
16044	Wheat Bran	Neshanic	14.69	13.00	5.35	3.50	10.90	12.00	12.00	
16044	Martenis Bros., New York City.									
16143	Mauser Mill Co., Treichlers, Pa.	Manassquan	17.00	14.00	4.67	5.00	10.20	9.00	9.00	
16143	Pure Wheat Bran.	Belvidere	9.20	15.38	3.34	2.00	7.42	10.00	10.00	
16097	McMurtrie Milling Co., Belvidere, N. J.	Millville	8.80	14.06	3.94	3.50	8.65	8.65	8.65	
160253	Millville Flour and Grain Co., Millville, N. J.	Swedesboro	8.06	15.38	4.63	.....	8.89	.....	.....	
160373	Geo. B. Mitchell, Swedesboro, N. J.									
160373	National Feed Co., St. Louis, Mo.	Camden	16.31	14.50	3.83	4.00	8.93	10.00	10.00	
160390	Wheat Bran									
160390	New Prague Flouring Mill Co., New Prague, Minn.	Medford	15.69	14.50	4.68	4.00	10.53	11.00	11.00	
16005	Seal of Minnesota Wheat Bran.	Camden	8.35	14.50	4.68	4.00	10.57	11.00	11.00	
16036	Seal of Minnesota Wheat Bran.									
16040	Niagara Falls Milling Co., Niagara Falls, N. Y.	Paterson	14.25	14.00	5.67	3.00	10.06	13.00	13.00	
16040	Choice Wheat Bran.									
16231	Choice Wheat Bran.	Perth Amboy	14.40	14.00	5.46	3.00	10.19	13.00	13.00	

<sup>1</sup> With ground screenings not exceeding mill run.



# WHEAT MIDDINGS.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	PROTEIN.		FAT.		FIBER.	
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
				Moisture.				
160021	W. W. Adair & Co., Raritan, N. J.	Raritan	16.13	12.00	4.50	3.50	3.63	8.00
160162	Wheat Middlings	Woodstown	11.81	14.00	5.28	3.50	3.38	8.00
16701	C. C. Avis, Woodstown, N. J.							
160233	M. F. Baringer, Philadelphia, Pa.	Lafayette	8.72	16.00	4.05	4.00	3.19	7.00
16404	Trenton Milling Co.'s Wheat Middlings	Bridgeton	9.72	16.69	4.89	5.57	4.32	4.15
160235	E. Bone & Johnson Bros., Bridgeton, N. J.							
160236	Buffalo Cereal Co., Buffalo, N. Y.	Rutherford	12.89	16.00	6.09	4.50	5.54	8.00
160237	Flour Middlings							
160238	L. G. Campbell Milling Co., Owatonna, Minn.	Morristown	9.10	16.80	5.88	5.01	4.82	8.92
16237	Geo. C. Christian & Co., Minneapolis, Minn.	Metuchen	15.81	14.00	5.32	4.00	5.55	8.00
160096	Berkshire Wheat Flour Middlings							
160048	L. Christian & Co., Minneapolis, Minn.	Flemington	9.15	15.50	5.37	4.65	6.72	6.40
160235	Matchless Standard Wheat Middlings	Clinton	11.05	12.00	4.55	3.50	2.45	3.00
160235	The Clinton Mills, Clinton, N. J.							
160235	The Cockley Milling Co., Lexington, O.	Bridgeton	10.70	16.20	3.81	4.00	5.23	5.00
160235	Brown Middlings							
160235	Commander Mill Co., Minneapolis, Minn.	Passaic	9.05	15.00	5.21	4.00	7.56	9.00
160235	Commander Standard Middlings							
160235	Commercial Milling Co., Detroit, Mich.	Ridgewood	8.56	13.50	5.82	4.50	7.43	10.00
160235	Standard Wheat Middlings							
160235	Wm. G. Crocker, Minneapolis, Minn.	Caldwell	9.27	17.00	5.67	5.00	4.85	6.00
160235	Wheat Flour Middlings	Caldwell	8.74	15.69	5.82	5.00	7.79	9.50
160235	Wheat Standard Middlings	Murray Hill	9.54	16.38	6.07	4.50	4.93	10.50
160235	J. G. Davis Co., Rochester, N. Y.							
160235	J. Sanford Davis, Greenwich, N. J.	Greenwich	9.90	15.13	5.42	4.00	3.38	2.50
160235	Brown Wheat Middlings	Greenwich	11.37	13.94	1.85	1.00	0.76	1.00
160235	Fancy White Middlings							
160235	Duluth-Superior Milling Co., Duluth, Minn.	Somerville	8.92	16.50	5.70	4.75	6.24	7.75
160235	IS Middlings	Somerville	9.22	15.63	5.47	5.00	6.28	7.00
160235	Flour Middlings							
160235	Eagle Roller Mill Co., New Uim, Minn.	Dover	7.97	14.71	5.17	4.40	9.05	10.00
160235	Wheat Middlings							
160235	B. A. Eckhart, Chicago, Ill.	Woodstown	9.76	15.69	3.55	4.00	3.61	7.00
160235	Flour Middlings							

<sup>1</sup> With ground screenings not exceeding mill run.

\* Not included in the average.



## WHEAT MIDLINGS—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.	PROTEIN.		FAT.		FIBER.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
16631	Phelps & Sibley Co., Cuba, N. Y.	Paterson .....	9.85	16.56	16.00	5.90	5.50	7.96	10.00
16171	Wheat Middlings .....	Jamesburg .....	8.79	16.31	15.00	4.55	4.50	9.67	10.00
16088	Wheat Standard B Middlings .....	Camden .....	10.45	16.44	14.00	4.93	4.00	4.50	5.50
160167	Quaker City Flour Mills Co., Philadelphia, Pa.	Woodstown .....	9.88	16.56	14.00	4.90	4.00	4.43	5.50
16982	Winter Wheat Middlings .....	Riegelsville .....	9.84	14.44	13.69	3.83	3.59	5.85	6.10
16983	John L. Riegel & Son, Riegelsville, N. J.	Riegelsville .....	10.51	14.25	13.44	3.21	3.15	2.05	3.89
16085	Wheat Middlings .....	Long Branch .....	8.80	14.75	16.00	4.22	4.00	3.71	4.00
16382	Shane Bros. & Wilson Co., Philadelphia, Pa.	Oradell .....	8.54	15.56	15.00	3.46	.....	1.13	.....
160062	Middlings .....	High Bridge .....	10.89	13.81	15.00	2.70	4.00	1.77	6.00
160089	Slater & Jones, High Bridge, N. J.	Stockton .....	10.28	15.81	13.00	5.29	4.00	3.67	7.00
160275	Jos. Smith & Co., Stockton, N. J.	Millville .....	9.71	16.00	15.00	5.14	4.00	5.00	9.00
16551	T. C. Souder & Son, Millville, N. J.	Passaic .....	8.91	16.13	15.00	5.79	4.00	8.55	8.00
16736	Star and Crescent Milling Co., Chicago, Ill.	Boonton .....	8.95	16.31	16.00	3.50	4.00	4.37	6.00
16908	Crescent Wheat Middlings .....	Hampton .....	9.52	15.69	14.00	4.72	4.00	3.78	8.00
16988	W. W. Supplee, Hampton, N. J.	Millford .....	10.86	12.75	12.10	2.45	3.00	1.44	2.00
169410	W. & W. E. Thomas, Milford, N. J.	Trenton .....	9.58	16.25	14.50	4.49	3.75	4.29	5.00
16312	A. Thompson Co., Trenton, N. J.	Kingston .....	11.42	14.03	14.03	4.52	4.50	2.85	7.40
160266	N. Thompson & Co., Kingston, N. J.	Trenton .....	9.00	14.13	15.00	3.82	3.00	3.14	4.00
16104	Trenton Flour Mill Co., Trenton, N. J.	Vineland .....	8.88	12.44	.....	2.06	.....	1.39	.....
16075	*J. D. Walls & Co., Philadelphia, Pa.	Eatontown .....	6.90	16.56	15.00	5.97	5.00	9.05	9.50
160031	Washburn-Crosby Co., Minneapolis, Minn.	Camden .....	7.67	15.50	15.00	5.34	5.00	7.58	9.50
16924	Wheat Standard Middlings .....	Frenchtown .....	9.92	14.56	14.00	4.20	4.05	4.19	2.02
16943	Wormat's Mills, Frenchtown, N. J.	Somerville .....	9.20	18.89	12.00	5.30	3.50	4.75	10.00
.....	W. H. H. Wyckoff Co., Somerville, N. J.	Neshanic .....	9.21	14.94	12.00	4.15	3.00	3.98	9.00
.....	L. A. Zohe, Neshanic, N. J.	Average .....	9.71	15.86	.....	4.87	.....	5.00	.....

<sup>1</sup> With ground screenings not exceeding mill run.

\* Not included in the average.



# RYE MIDDINGS.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	PROTEIN.		FAT.		FIBER.	
			Moisture.	Found.	Guaranteed.	Found.	Guaranteed.	Found.
16224	A. K. Ashby, Burlington, N. J.	Burlington	10.40	13.50	.....	2.53	.....	.....
160287	Oscar Chafey, Chesterfield, N. J.	Chesterfield	12.90	10.13	.....	1.88	.....	2.50
160041	E. H. Deats, Pittstown, N. J.	Pittstown	12.21	13.31	12.81	3.77	3.50	1.68
160211	Everham & Burtis, Allentown, N. J.	Allentown	12.63	11.63	10.50	2.88	2.00	3.80
163069	Garden State Milling Co., Bordentown, N. J.	Bordentown	12.17	13.38	10.50	2.42	2.00	2.88
160299	Gross Bros., Hightstown, N. J.	Hightstown	11.15	12.00	9.65	2.93	2.20	2.00
16238	Howell & Sons, Lawrence, N. J.	Lawrence	10.97	14.81	12.50	2.70	1.82	2.74
160208	Hutchinson Bros., Crosswicks, N. J.	Crosswicks	13.81	12.06	10.63	3.18	2.20	3.11
160941	I. B. Keener, Belvidere, N. J.	Belvidere	11.00	13.50	8.00	2.16	2.30	2.03
160820	Kirby Bros., Medford, N. J.	Medford	12.12	10.56	10.00	2.36	1.00	6.00
160332	C. H. Kirby, Medford, N. J.	Medford	11.50	11.31	11.00	1.98	2.00	2.50
160219	G. H. Kirby, Allentown, N. J.	Allentown	12.40	12.25	11.69	2.01	2.25	2.50
160291	Wm. Kirby, Etra, N. J.	Etra	12.72	11.56	10.38	2.72	3.07	2.75
160321	Ridgway Bros., Pemberton, N. J.	Pemberton	12.60	11.54	8.75	2.81	1.75	3.00
160407	Turnersville Roller Mills, Sewell, N. J.	Turnersville	12.35	14.69	14.30	2.24	2.11	2.05
160128	Henry G. Werner, Deans, N. J.	Deans	12.71	11.63	11.56	2.53	2.90	2.47
160343	J. R. Wilkinson, Vincentown, N. J.	Vincentown	10.81	10.31	7.63	2.14	2.32	2.35
160032	Worman Mills, Frenchtown, N. J.	Frenchtown	12.42	11.69	8.31	1.76	1.10	1.42
160290	Yardville Roller Mills, Yardville, N. J.	Yardville	11.96	11.50	11.00	2.22	1.66	2.13
160290	Average	Average	12.04	12.18	.....	2.34	2.25	2.50
						2.48	.....	.....

# BUCKWHEAT FEED.

160046	E. H. Deats, Pittstown, N. J.	Pittstown	13.32	23.44	25.44	6.44	5.60	3.92	5.00
16831	J. D. Gibbs, Vienna, N. J.	Vienna	13.07	21.06	22.06	5.82	5.64	1.81	5.42
160090	Jos. Smith & Co., Stockton, N. J.	Stockton	14.22	19.50	18.00	5.14	3.00	1.81	5.00
160030	Wormans Mills, Frenchtown, N. J.	Frenchtown	14.36	13.06	18.31	3.30	2.80	0.93	1.61
	Average	Average	13.54	21.23	.....	5.80	.....	2.74	.....

<sup>1</sup> Material sold as buckwheat offal.

<sup>2</sup> Material sold as buckwheat middlings. Not included in the averages.

## BUCKWHEAT MIDDINGS.

16895	Armstrong & Demarest, Lafayette, N. J.	Lafayette	12.77	29.75	26.38	5.07	6.52	1.96	2.98
16896	Warren Beatty, Hacktstown, N. J.	Hacktstown	14.37	29.06	30.00	8.40	7.00	6.78	6.00
16897	J. M. Conover & Son, Bartley, N. J.	Bartley	11.84	32.63	25.00	8.57	7.33	4.36	9.54
16898	C. H. Crisman, Branchville, N. J.	Branchville	13.77	29.00	10.00	8.22	2.00	2.20	10.00
16899	M. R. Hildebrandt, Flanders, N. J.	Flanders	12.21	28.94	25.00	6.92	7.00	2.12	3.00
16900	I. A. Hoffman & Son, German Valley, N. J.	German Valley	12.24	27.44	31.38	7.65	8.40	2.40	3.30
16901	E. J. Huff, State Falls, N. J.	State Falls	12.03	31.75	32.25	8.79	8.31	3.31	6.19
16902	H. B. Ingersoll, Hamburg, N. J.	Hamburg	12.36	32.81	30.00	9.04	7.80	3.35	4.00
16903	I. B. Keener, Belvidere, N. J.	Belvidere	12.83	25.81	26.38	6.64	6.86	5.53	5.27
16904	M. R. Lanning, Marksboro, N. J.	Marksboro	12.83	27.81	23.00	7.36	5.00	6.00	4.00
16905	The Manning Co., Sussex, N. J.	Sussex	13.42	22.69	22.00	7.36	6.00	1.81	2.75
16906	McMurtrie Milling Co., Belvidere, N. J.	Belvidere	12.22	30.56	8.22	7.93	1.19	2.56	14.00
16907	Mesler & Shamon, Blairstown, N. J.	Blairstown	12.30	30.94	30.94	8.00	8.00	4.19	4.19
16908	Chas. C. Ort, Hacktstown, N. J.	Hacktstown	11.33	27.56	5.00	7.77	2.00	6.82	30.00
16909	Springdale Mills, Newton, N. J.	Newton	11.72	33.19	28.90	8.52	7.10	2.09	4.10
16910	Springdale Mills, Newton, N. J.	Newton	11.72	34.06	10.00	9.28	2.80	4.47	40.00
16911	W. Stires, Bridgeville, N. J.	Bridgeville	12.09	29.44	22.00	7.84	6.00	2.26	6.00
16912	W. & W. E. Thomas, Milford, N. J.	Milford	11.96	28.06	29.30	7.48	6.50	4.91	5.10
16913	W. J. Vusler, Hope, N. J.	Hope	11.97	24.94	24.94	6.47	6.47	2.30	2.30
16914	E. J. S. Wiseburn & Son, Stephentown, N. J.	Stephentown	10.75	32.94	15.00	8.94	5.00	8.04	25.00
16915	Wormans Mills, Frenchtown, N. J.	Frenchtown	11.76	32.13	30.10	8.84	6.80	6.42	4.40
16916	Average		12.30	29.26		7.86		3.88	

1 Material sold as buckwheat offal.

2 Material sold as buckwheat feed.

3 Material sold as buckwheat bran.

4 Material sold as buckwheat bran and middlings.

## BUCKWHEAT OFFAL.

16917	Belvidere Flouring Mill Co., Belvidere, N. J.	Belvidere	11.43	19.75	5.00	5.45	1.00	18.17	30.00
16918	Frank Bird, Flemington, N. J.	Flemington	9.38	16.31	16.00	4.13	4.00	16.50	15.00
16919	L. W. Dorland, High Bridge, N. J.	High Bridge	11.62	16.19	24.31	3.97	1.24	18.58	3.04
16920	G. W. Fischer, Port Murray, N. J.	Port Murray	11.72	25.63	32.00	7.00	9.00	12.80	4.00
16921	H. B. Ingersoll, Hamburg, N. J.	Hamburg	11.40	11.81	17.50	3.21	4.40	27.84	18.00
16922	G. G. MacPherson, Lebanon, N. J.	Lebanon	12.25	16.06	17.00	4.71	4.50	14.73	6.00
16923	Reece & Greenly, Millville, Pa.	Columbus	10.01	13.25	13.00	3.35	3.00	27.74	29.00
16924	W. H. Reger & Son, White House, N. J.	White House	12.72	20.51	20.38	5.90	3.50	9.69	11.58
16925	J. A. Tiger, Calton, N. J.	Calton	12.07	19.31	14.00	5.82	4.00	17.29	25.64
16926	Wolf Bros., Paterson, N. J.	Newark	8.51	12.56	16.00	3.01	4.00	24.91	16.00
16927	Average		11.11	17.24		4.61		18.83	

1 Material sold as buckwheat feed.

2 Material sold as buckwheat bran.

3 Material sold as buckwheat middlings.

4 Material sold as buckwheat grits.

## CORN MEAL. CORN FEED MEAL.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	PROTEIN.		FAT.		FIBER.	
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
160024	W. W. Adair & Co., Raritan, N. J.	Raritan	12.47	8.06	8.00	3.10	1.00	4.00
160404	C. C. Demsey & Co., Gloucester, N. J.	Gloucester	14.40	7.06	7.00	4.34	1.10	1.25
164300	Deposit Milling Co., Deposit, N. Y.	Deposit	11.65	9.06	8.00	3.56	1.84	3.00
160445	Deposit Milling Co., Deposit, N. Y.	Paterson	12.07	9.13	8.00	3.63	1.86	3.00
163891	Empire Mills, Olean, N. Y.	Plainfield	10.87	9.06	8.00	3.34	1.97	2.00
162291	John Haganan, Perth Amboy, N. J.	Perth Amboy	10.51	9.25	8.44	5.19	2.81	1.63
160103	Geo. C. Higgins & Son, Three Bridges, N. J.	Three Bridges	10.87	8.44	8.94	4.71	1.90	1.63
168881	G. F. Hill & Co., Gladstone, N. J.	Gladstone	13.81	9.06	7.20	4.22	2.80	2.90
168641	H. N. Miller, Peapack, N. J.	Peapack	12.11	9.00	9.00	4.04	1.76	2.90
160254	Millville Flour and Grain Co., Millville, N. J.	Millville	10.25	9.03	7.94	3.66	1.41	1.33
164804	Est. of H. L. Pierson, South Orange, N. J.	South Orange	12.65	9.06	7.75	4.19	1.90	1.31
165311	M. W. Simonsen Co., Newark, N. J.	Maplewood	11.06	8.56	8.57	3.25	1.49	2.00
167171	Toga Mill and Elevator Co., Waverly, N. Y.	Newark	10.13	9.31	9.02	3.47	2.68	9.24
160717	Derby Meal (Corn feed meal)	Sussex	15.49	6.50	8.64	4.29	2.53	3.50
160412	N. Thompson & Co., Kingston, N. J.	Kingston	11.58	8.85	9.10	2.22	1.34	1.68
160406	Turnersville Roller Mills, Sewell, N. J.	Turnersville	11.08	8.81	8.56	5.09	1.86	2.10
160511	F. D. Wilkoff, Red Bank, N. J.	Red Bank	11.59	8.31	8.00	5.55	1.55	0.91
160831	Vernon Wortman, Pottersville, N. J.	Pottersville	12.06	9.19	9.00	4.27	2.83	3.00
162021	Monroe Wyckoff, Jamesburg, N. J.	Jamesburg	11.76	8.88	9.00	3.50	1.58	2.00
	Average					4.17	1.84	

<sup>1</sup> Sample contained small amount of cob meal. Not included in the average.

<sup>2</sup> Sample was moldy. Not included in the average.

## CORN BRAN.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	PROTEIN.	FAT.	FIBER.
160312	M. F. Baringer, Philadelphia, Pa.	Moorestown	8.24	10.10	7.13
164911	A. Cyphers Co., Newark, N. J.	Newark	11.00	5.00	15.00
164901	Corn Bran	Newark	10.56	4.95	7.13
164901	Ground Corn Bran	Newark	11.44	5.00	13.00
160398	Thompson & Mould, Goshen, N. Y.	Lafayette	9.88	10.43	7.61
162111	Walters Milling Co., Philadelphia, Pa.	Mt. Holly	9.56	4.00	14.00
	Average		10.49	7.37	6.98

## CORN AND COB MEAL.

16848	Warren Beatty, Hackettstown, N. J.	13.30	6.88	7.00	3.04	3.00	7.12	10.00
169049	The Clinton Mills, Clinton, N. J.	11.31	7.25	6.00	3.52	3.00	5.77	5.00
16910	Harvey S. Cole, Washington, N. J.	12.08	7.31	7.31	3.23	3.28	3.93	3.11
16955	Thos. Craig, Buttzville, N. J.	18.46	7.81	6.00	1.43	3.00	5.05	10.00
16968	L. W. Dorland, High Bridge, N. J.	16.67	6.63	7.50	1.98	3.00	5.75	6.00
16856	Frank Dufford, Middle Valley, N. J.	14.09	6.88	7.56	2.62	3.36	6.77	6.00
16838	G. W. Fischer, Port Murray, N. J.	11.51	7.63	6.00	3.28	2.00	5.77	6.00
16875	G. W. Hildebrandt, Pottersville, N. J.	9.55	7.81	.....	.....	.....	6.14	.....
16854	I. A. Hoffman & Son, German Valley, N. J.	18.35	7.38	7.40	0.98	3.30	4.88	4.88
169038	W. F. Hummer, Mt. Pleasant, N. J.	22.44	7.25	7.55	0.99	2.80	3.86	3.90
16890	W. I. Jacoby, Finesville, N. J.	11.78	7.83	7.83	3.84	2.94	4.04	3.94
16943	J. M. Kostenbader, Delaware, N. J.	18.21	7.66	4.00	1.40	1.00	4.67	30.00
16909	M. R. Lanning, Marksboro, N. J.	18.60	7.13	5.00	1.92	2.00	2.32	7.00
169058	Lebanon Valley Mills, Lebanon, N. J.	17.44	6.94	8.00	1.93	3.50	4.55	3.50
169070	G. MacPherson, Lebanon, N. J.	13.75	7.00	8.00	3.03	3.62	6.49	4.80
169003	McMurtre Milling Co., Belvidere, N. J.	25.41	7.75	6.00	0.57	3.00	5.71	10.00
16895	H. W. Miller, Peapack, N. J.	19.59	6.31	7.44	1.10	3.39	3.54	5.78
16840	Chas. C. Ort, Hackettstown, N. J.	17.76	7.50	6.00	1.72	2.00	4.97	10.00
16916	J. L. Riegel & Son, Riegelsville, N. J.	10.92	7.63	6.31	3.80	2.23	4.96	7.38
169016	F. I. Reger, Somerville, N. J.	10.64	6.81	7.50	3.57	2.60	1.74	8.60
169055	W. H. Reger & Son, White House, N. J.	11.67	7.00	8.19	3.51	2.56	5.03	2.06
169063	Slater & Jones, High Bridge, N. J.	25.87	6.94	7.00	0.60	3.00	3.43	7.00
169046	J. A. Sloff, Pittstown, N. J.	18.56	7.75	5.00	2.14	2.00	3.76	6.00
16951	W. Stires, Bridgeville, N. J.	16.44	7.44	6.00	1.91	2.00	5.48	12.00
16817	J. A. Tiger, Calton, N. J.	10.63	7.31	6.50	3.86	3.00	5.66	4.30
16954	E. J. Visler, Hope, N. J.	20.85	6.88	7.00	0.60	3.50	4.60	7.00
16902	J. S. Wiseburn & Son, Stephensburg, N. J.	12.89	7.25	7.00	3.20	3.00	5.95	10.00
16851	Vernon Wortman, Pottersville, N. J.	11.88	6.19	6.50	2.74	3.20	9.97	5.50
16796	Millington, N. J.	11.42	7.31	6.50	3.38	3.20	5.32	5.50
	Average .....	11.91	7.29	.....	3.32	.....	5.92	.....

<sup>1</sup> Moldy. Not included in the average.<sup>2</sup> Corn feed meal. Not included in the average.

## CORN AND OATS.

16107	Henry Allen, Eatontown, N. J.	11.13	9.63	7.00	4.00	3.00	2.25	11.00
160378	Samuel Anderson, Hammonon, N. J.	10.40	9.63	9.00	4.36	4.00	5.01	5.00
16812	C. Barker, Bernardsville, N. J.	10.55	8.50	8.00	4.58	3.00	3.88	7.00
169043	Bodine & Co., Pittstown, N. J.	13.08	8.56	9.50	3.70	4.00	2.47	2.50
16280	Buffalo Cereal Co., Buffalo, N. Y.	8.69	10.94	9.00	6.18	4.00	5.44	4.00
16358	Commercial Mill and Elevator, Plainfield, N. J.	11.01	9.75	10.50	3.77	3.00	2.49	4.00
16633	Deposit Milling Co., Deposit, N. Y.	11.08	10.31	9.00	3.97	4.00	3.97	6.00
16602	N. Drake, Newark, N. J.	10.32	10.69	10.00	4.17	4.00	3.74	4.00
16857	Frank Dufford, Middle Valley, N. J.	13.12	8.06	7.69	2.86	3.40	5.69	9.98
16677	G. T. Freeman, Whippany, N. J.	12.02	9.88	9.00	4.68	5.00	1.86	4.00
160114	Alvin Hill & Son, Flemington, N. J.	13.71	9.19	9.63	4.25	4.14	5.59	3.66
160107	B. Huffman, Ringoes, N. J.	13.36	7.88	9.00	3.98	3.50	1.71	3.00
160201	R. S. Johnson, Bridgeton, N. J.	13.23	9.00	10.13	4.55	4.44	2.93	2.58
160094	G. M. Kuhl, Flemington, N. J.	15.24	9.50	10.00	3.78	4.50	3.81	4.00
160084	Lambert & Kerr, Lambertville, N. J.	11.24	10.50	10.00	4.40	4.00	4.07	7.00

# CORN AND OATS—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	PROTEIN.		FAT.		FIBER.		
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
									Moisture.
160059	Lebanon Valley Mills, Lebanon, N. J.	Lebanon	10.08	9.94	10.25	4.61	4.31	4.41	2.95
16472	Limond & Co., Hoboken, N. J.	Hoboken	9.24	11.50	9.37	9.07	4.87	4.43	7.63
16307	Long Dock Mills, Jersey City, N. J.	Jersey City	9.90	10.13	7.00	4.51	3.00	3.98	11.00
16140	V. T. Miller, Manasquan, N. J.	Manasquan	11.42	9.56	9.00	4.63	3.00	2.00	4.00
16075	Geo. Q. Moore & Co., Inc., Binghamton, N. Y.	Towaco	10.10	9.63	8.50	4.34	4.50	4.58	9.00
16839	Neighbor & Son, Califon, N. J.	Califon	10.00	9.69	9.25	4.11	4.28	2.32	2.4
16192	Old Bridge Milling Co., Old Bridge, N. J.	Old Bridge	9.90	9.44	10.00	4.19	4.28	2.68	5.09
16687	Est. of H. L. Pierson, South Orange, N. J.	Maplewood	9.90	11.13	8.00	4.69	3.00	3.88	4.75
190017	F. I. Reger, Somerville, N. J.	Somerville	12.73	8.56	8.60	3.61	2.80	6.54	9.20
190017	A. S. Rockefeller, Flemington, N. J.	Flemington	11.75	8.69	9.00	4.42	4.00	1.99	4.50
160305	C. W. Russell, New Brunswick, N. J.	New Brunswick	11.12	8.94	10.81	4.44	4.07	2.73	6.09
16189	C. M. Sheppard & Co., South River, N. J.	South River	10.63	10.06	9.00	3.85	3.50	3.08	6.00
160047	J. A. Sloff, Pittstown, N. J.	Pittstown	14.29	8.00	6.00	3.88	3.00	1.73	5.00
160122	Z. V. Stillwell, Villa Park, N. J.	Villa Park	11.69	9.06	8.88	3.31	1.95	3.05	1.60
190411	N. Thompson & Co., Kingston, N. J.	Kingston	11.96	8.03	8.55	3.88	4.00	3.27	6.00
16353	Union Grain Co., Plainfield, N. J.	Plainfield	11.12	9.88	10.06	4.45	4.64	2.55	2.90
16434	Van Winkle Grain Co., Paterson, N. J.	Paterson	10.28	11.56	10.63	2.91	4.18	4.75	8.21
16039	Fred. D. Wilkoff, Red Bank, N. J.	Red Bank	10.49	9.44	9.00	4.58	3.50	6.32	8.00
16098	M. G. & A. P. Wyckoff Co., Manasquan, N. J.	Manasquan	11.00	9.75	10.00	4.50	4.50	4.01	5.50
16201	M. Wyckoff, Jamesburg, N. J.	Jamesburg	10.29	9.63	10.00	3.53	3.00	3.14	2.00
16341	L. A. Zohe, Neshanic, N. J.	Neshanic	10.39	9.25	8.00	4.20	3.00	2.60	10.00
	Average		11.23	9.55	.....	4.30	.....	3.58	.....

<sup>1</sup> Sample contained an excess of oat hulls.

## ALFALFA MEAL.

16220	American Milling Co., Peoria, Ill.	Mt. Holly	7.91	15.25	1.93	25.00	
16161	Denver Alfalfa Mfg. & Products Co., Hartman, Col.	Spoutswood	8.08	15.38	2.16	22.23	35.00
16043	Edwards & Loomis Co., Chicago, Ill.	Red Bank	7.23	11.69	1.25	35.48	35.00
190341	Howard H. Hanks Co., Chicago, Ill.	Mt. Holly	7.37	12.69	1.23	33.22	30.00
160310	Haywood Alfalfa Warehouse Co., Kansas City, Mo.	New Brunswick	8.04	14.19	1.61	28.03	35.00
16869	Algreen Alfalfa Meal	Bernardsville	8.04	14.56	2.03	26.99	33.00
16044	National Feed Co., St. Louis, Mo.	Red Bank	8.72	15.69	1.63	24.02	30.00
16797	Omaha Alfalfa Milling Co., Omaha, Neb.	Millington	6.32	10.81	1.34	32.98	30.00
	Park & Pollard Co., Boston, Mass.						
	M. C. Peters Mill Co., Omaha, Neb.						
16321	Lucern Alfalfa Meal	Hackensack	6.86	12.69	1.29	31.67	33.00
16461	Chas. C. Ramey, New York City	Elizabeth	6.65	13.38	1.30	33.31	

# ALFALFA MEAL—Continued.

16004	Somers & Co., San Francisco, Cal.	Camden	6.90	15.56	16.60	1.78	1.40	25.84	29.50
	Red Star Brand Alfalfa Meal.	Pennington	8.23	18.38	15.00	2.53	2.50	22.58	27.50
160076	E. J. Woolworth, Kearney, Neb.	Average	7.53	14.19	.....	1.67	.....	28.45	.....

## DRIED BEET PULP.

160216	Hottel & Co., Milwaukee, Wis.	Allentown	8.82	8.56	8.00	0.90	0.50	19.05	20.00
16303	The Larrowe Milling Co., Detroit, Mich.	Pennington	8.86	9.00	8.00	0.58	0.50	18.55	20.00
16530	The Larrowe Milling Co., Detroit, Mich.	Newark	8.54	7.69	8.00	0.65	0.50	19.58	20.00
	Average	Average	8.74	8.42	.....	0.71	.....	19.06	.....

## COCOANUT MEAL.

16755	Oil Seeds Co., Bayonne, N. J.	Andover	8.78	19.88	20.00	10.77	7.00	8.76	10.00
160051	Coco Brand	Clinton	6.72	23.31	20.00	10.14	7.00	8.90	10.00
	Average	Average	7.75	21.60	.....	10.46	.....	8.83	.....

## COPRA CAKE MEAL. Ingredients identified—Cocoanut Meal.

16217	M. F. Barringer, Philadelphia, Pa.	Mt. Holly	8.19	21.75	24.60	7.54	8.20	10.25	10.25
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## GROUND FLAX SCREENINGS.

16008	Taylor Bros., Camden, N. J.	Camden	8.84	11.06	10.70	6.82	4.40	21.02	17.00
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## OAT HULLS.

16735	The H.-O. Company, Buffalo, N. Y.	Boonton	5.64	3.06	2.50	1.13	1.50	30.45	28.00
	Reground Oat Hulls.								

## PEANUT OIL MEAL.

160418	Oil Seeds Co., Bayonne, N. J.	Belle Mead	7.92	47.56	40.00	7.90	7.00	4.46	7.00
16948	Alpha Brand	Neshanic	6.90	35.44	40.00	13.29	7.00	6.59	7.00
16892	Beta Brand	Vienna	7.60	33.50	30.00	10.00	7.00	9.37	8.00
16947	Beta Brand	Neshanic	7.33	36.03	30.00	9.84	7.00	6.68	8.00
	Average	Average	7.44	38.14	.....	10.26	.....	6.78	.....

## SCREENINGS.

160176	Limond & Co., Hoboken, N. J.	Long Branch	10.54	14.13	.....	2.25	.....	5.53	.....
169177	Wheat Screenings	Long Branch	10.10	10.50	.....	9.14	.....	2.70	.....
160178	Corn Screenings	Long Branch	8.57	17.06	.....	13.27	.....	9.54	.....
	Seeds (largely weed seeds)								

### RYE FEED.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
160286	J. P. Golden, Chesterfield, N. J. Rye Bran and Middlings.....	Chesterfield .....	11.94
16846	The Stone Mill, High Bridge, N. J. Rye Bran and Middlings.....	High Bridge .....	11.31
	Average .....		11.62

### WHEAT FEED.

16233	Ballard & Ballard, Louisville, Ky. Ballard's Kentucky Farm Feed.....	Perth Amboy .....	10.25
160034	Willard Curtis, Everittstown, N. J. Home-made Bran and Middlings.....	Everittstown .....	10.31
16938	Duluth-Superior Milling Co., Duluth, Minn. Boston Mixed Feed.....	Somerville .....	9.14
160005	Kemper Mill and Elevator Co., Kansas City, Mo. Crescent Mixed Feed.....	Marksboro .....	10.23
16710	Russell-Miller Milling Co., Minneapolis, Minn. Occident Wheat Feed.....	Sussex .....	7.93
16607	Sparks Milling Co., Alton, Ill. Try Me Mixed Feed.....	Hamburg .....	8.99
16972	C. W. Wagar & Co., Philadelphia, Pa. Middlesex Winter Wheat Mixed Feed.....	Blairstown .....	7.95
	Average .....		9.26

### WHEAT MIDDLINGS AND MAIZO RED DOG FLOUR.

16168	Chas. A. Krause Milling Co., Milwaukee, Wis. Badger Fancy Middlings.....	Englishtown .....	8.53
16753	Badger Fancy Middlings.....	Branchville .....	8.02
	Average .....		8.28

### WHEAT AND RYE MIDDLINGS.

16764	Mauser Mill Co., Treichlers, Pa. Wheat and Rye White Middlings.....	Newton .....	9.72
16829	Wheat and Rye Red Middlings.....	Flanders .....	9.23
	Average .....		9.47

### FEED MIXTURES.

16244	Alfocorn Milling Co., East St. Louis, Ill. Leader Horse and Mule Feed.....	Perth Amboy ....	9.17
16585	Leader Horse and Mule Feed.....	Paterson .....	11.81
16533	Sweet Meal .....	Newark .....	9.85

### RYE FEED.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
12.38	.....	2.35	.....	3.49	.....	Rye bran and rye middlings.
13.88	13.94	3.00	3.09	3.69	3.13	Rye bran and rye middlings.
13.13	.....	2.67	.....	3.59	.....	

### WHEAT FEED.

16.69	16.45	4.10	4.60	5.91	6.42	Wheat bran and wheat middlings.
14.06	10.00	5.09	3.25	7.23	5.34	Wheat bran and wheat middlings.
14.13	15.00	5.26	4.25	8.77	9.75	Wheat bran, wheat middlings, low grade flour with ground screenings not exceeding mill run.
16.19	16.00	4.17	4.00	7.67	10.00	Wheat bran and wheat middlings with ground screenings not exceeding mill run.
14.19	15.00	5.63	4.50	7.74	10.00	Wheat bran and wheat middlings.
15.56	16.00	4.65	3.50	8.59	8.00	Wheat bran and wheat middlings with ground screenings not exceeding mill run.
17.38	14.50	3.91	4.00	7.65	10.00	Wheat bran and wheat middlings with ground screenings not exceeding mill run.
15.46	.....	4.69	.....	7.65	.....	

### WHEAT MIDLINGS AND MAIZO RED DOG FLOUR.

12.50	12.00	6.84	4.50	4.62	7.00	Maizo red dog flour and wheat middlings with ground screenings not exceeding mill run.
12.69	12.00	7.56	4.50	3.98	7.00	Same as sample No. 16168.
12.60	.....	7.20	.....	4.30	.....	

### WHEAT AND RYE MIDLINGS.

14.88	12.00	4.78	4.00	4.66	10.00	Wheat and rye middlings.
14.44	12.00	5.36	3.00	6.37	10.00	Wheat and rye middlings.
14.66	.....	5.07	.....	5.51	.....	

### FEED MIXTURES.

11.75	9.00	2.24	1.50	11.63	18.00	Corn, oats, alfalfa meal, molasses and salt. Cottonseed meal identified but not guaranteed.
8.81	9.00	1.24	1.50	11.41	18.00	Corn, oats, alfalfa meal, molasses and salt.
8.13	10.00	0.61	1.00	18.56	20.00	Alfalfa meal and molasses.

## FEED MIXTURES—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME	PLACE OF SAMPLING.	Moisture.
	<b>American Milling Co., Peoria, Ill.</b>		
16128	Sucrene Horse Feed with Alfalfa.....	Moorestown .....	10.09
160188	Sucrene Horse Feed with Alfalfa.....	Alloway .....	10.53
16703	Sucrene Dairy Feed.....	Sussex .....	9.90
160199	Sucrene Dairy Feed.....	Salem .....	9.58
16310	Sucrene Hog Meal .....	Bordentown .....	10.42
160155	Amco Alfalfa Molasses Feed.....	Trenton .....	10.59
160279	Tip Top Sugar Feed.....	Columbus .....	9.94
160347	Tip Top Sugar Feed.....	New Egypt .....	9.51
160352	Amco Fat Maker.....	Cookstown .....	10.54
	<b>Arcady Farms Milling Co., Rondout, Ill.</b>		
16569	Arcady Dairy Feed.....	Signac .....	11.00
16791	Arcady Dairy Feed.....	Millington .....	9.41
16779	Arcady Horse Feed.....	Dover .....	10.96
	<b>M. F. Baringer, Philadelphia, Pa.</b>		
160004	Big B Dairy Feed.....	Marksboro .....	10.56
	<b>Blatchford Calf Meal Factory, Waukegan, Ill.</b>		
16872	Blatchford's Milk Mash.....	Far Hills .....	8.46
16730	Blatchford's Pig Meal.....	Morristown .....	8.29
	<b>Buffalo Cereal Co., Buffalo, N. Y.</b>		
16411	Bufceco Horse Feed.....	Rutherford .....	8.83
16529	Bufceco Stock Feed.....	Newark .....	8.90
16259	Bufceco Stock Feed.....	Metuchen .....	7.30
16605	Bufceco Chop Feed.....	Bloomfield .....	8.44
16556	Bufceco Chop Feed.....	Passaic .....	8.19
16403	Iroquois Stock Feed.....	Waldwick .....	9.21
	<b>Chapin &amp; Co., Hammond, Ind.</b>		
16106	Unicorn Dairy Ration.....	Eatontown .....	9.29
16977	*Unicorn Dairy Ration.....	Eatontown .....	8.58

\* Shipment represented by sample No. 16106, resampled by request of manufacturer.

## FEED MIXTURES—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
10.81	10.00	3.10	2.50	9.63	12.00	Molasses, alfalfa meal, corn, oats, barley and salt.
9.94	10.00	2.17	2.50	8.92	12.00	Same as sample No. 16128.
16.81	16.50	4.20	3.50	10.93	12.00	Molasses, cottonseed meal, corn gluten feed, ground grain screenings, clipped oat by-product and salt. Linseed oil meal guaranteed but not identified.
15.63	16.50	4.04	3.50	12.29	12.00	Same as sample No. 16703.
17.69	16.00	5.22	5.00	7.06	10.00	Corn gluten feed, ground grain screenings, linseed oil meal, corn meal, molasses and salt.
13.63	10.00	0.83	0.50	16.03	26.00	Alfalfa meal and molasses.
12.38	12.00	5.67	2.50	12.34	12.00	Molasses, ground grain screenings, clipped oat by-product, cottonseed meal and salt. Corn gluten feed and ground corn identified but not guaranteed.
12.50	12.00	4.72	2.50	11.68	12.00	Molasses, ground grain screenings, clipped oat by-product, cottonseed meal and salt.
10.50	10.00	3.92	3.50	8.75	12.00	Molasses, clipped oat by-product, oats, corn germ meal and salt. Corn gluten feed identified but not guaranteed.
18.13	16.00	4.35	3.50	10.74	15.00	Malt sprouts, brewers' dried grains, cottonseed meal, molasses, clipped oat by-product, ground grain screenings and salt.
15.63	16.00	3.26	3.50	15.87	15.00	Same as sample No. 16569.
10.56	9.00	2.07	2.00	12.06	12.00	Cracked corn, oats, alfalfa meal, molasses and salt.
21.00	16.50	4.49	3.50	9.58	12.00	Molasses, corn gluten feed, cottonseed meal, clipped oat by-product, ground grain screenings and salt.
20.50	20.00	3.97	4.00	6.34	7.50	Locust bean meal, unpressed flaxseed, wheat flour, barley meal, ground beans and peas, rice polish, linseed oil meal, ground cocoa shells, cocoanut meal, cottonseed meal, foenugreek, dried milk, anise, salt, bone, corn and oat meal, wheat middlings, beef scrap, fish and powdered limestone.
19.94	18.00	4.82	5.00	6.25	7.00	Linseed oil meal, oatmeal, wheat flour, barley meal, cottonseed meal, ground cocoa shells, bean meal, corn meal, crushed flaxseed, foenugreek and salt.
12.44	10.00	4.75	4.00	9.88	9.00	Ground oats, corn, oat shorts, oat middlings, oat hulls, corn gluten feed, linseed oil meal. Barley, wheat middlings and hominy feed guaranteed but not identified.
10.56	8.00	5.59	4.00	8.60	9.00	Ground corn and oats, hominy feed, oat shorts, oat middlings and oat hulls. Wheat middlings guaranteed but not identified. Cob meal identified but not guaranteed.
10.69	8.00	7.24	4.00	9.01	9.00	Ground corn and oats, wheat middlings, hominy feed, oat shorts, oat middlings and oat hulls.
10.00	7.00	5.46	3.00	9.43	9.00	Ground corn, oat shorts and oat hulls. Hominy feed guaranteed but not identified.
8.94	7.00	5.01	3.00	8.66	9.00	Ground corn, hominy feed, oat shorts and oat hulls.
10.31	8.00	3.78	3.00	8.17	11.00	Ground corn and oats, corn gluten feed, ground grain screenings, oat middlings, oat hulls, oat shorts and molasses. Small amount cottonseed meal present but not guaranteed.
23.69	26.00	5.73	5.50	10.34	10.00	Corn distillers' grains, cottonseed meal, corn gluten feed, malt sprouts, wheat bran and brewers' dried grains. Linseed oil meal, hominy feed and barley feed guaranteed but not identified.
24.31	26.00	5.78	5.50	9.89	10.00	Same as sample No. 16106.

## FEED MIXTURES—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16307	Clover Leaf Milling Co., Buffalo, N. Y. Clover Leaf Dairy Feed.....	Bordentown .....	9.81
160156	Clover Leaf Dairy Feed.....	Trenton .....	8.94
16218	Corn Products Refining Co., New York City. Diamond Hog Meal.....	Mt. Holly .....	8.88
16383	Albert Dickinson Co., Chicago, Ill. White Cross Stock Feed.....	Dumont .....	10.12
16116	Dixie Mills Co., East St. Louis, Ill. Dixie Horse and Mule Feed.....	Camden .....	11.59
160401	Dixie Horse and Mule Feed.....	Westville .....	11.35
16325	Polo Molasses Feed.....	Trenton .....	11.55
16296	Edwards & Loomis Co., Chicago, Ill. Harvest Horse Feed.....	Trenton .....	10.25
160379	Harvest Horse Feed.....	Hammonton .....	10.69
160377	Red Horn Dairy Feed.....	Hammonton .....	11.76
16400	Empire Grain and Elevator Co., Binghamton, N. Y. Egee Horse Feed.....	Campgaw .....	12.00
160007	Egee Stock Feed.....	Marksboro .....	8.49
16343	Empire Mills, Olean, N. Y. Empire Feed .....	Westwood .....	9.49
16368	Empire Feed .....	Plainfield .....	9.79
16802	Feed Products Milling Co., Chicago, Ill. Eatall Alfalfa Horse Feed.....	Murray Hill .....	10.03
16527	Eatall Alfalfa Horse Feed.....	Newark .....	9.17
16810	Eatall Meadow Feed .....	Bernardsville .....	10.57
16809	Eatall Horse Feed .....	Bernardsville .....	9.76
16965	Flory Milling Co., Bangor, Pa. Special Mixed Horse Feed.....	Hope .....	10.48
16038	Globe Elevator Co., Buffalo, N. Y. No. 1 Chop Feed.....	Red Bank .....	10.25
16136	No. 1 Chop Feed.....	Freehold .....	9.60
16100	Anchor Horse Feed.....	Long Branch .....	11.25
160225	Anchor Horse Feed.....	Hopewell .....	9.78
16091	Buffalo Stock Feed.....	Long Branch .....	10.21
16159	Buffalo Stock Feed.....	Spotswood .....	8.65
16134	Blue Ribbon Horse Feed.....	Freehold .....	11.54
16092	Blue Ribbon Horse Feed.....	Long Branch .....	9.20

## FEED MIXTURES—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
19.69	16.50	3.64	3.50	11.34	12.00	Cottonseed meal, corn gluten feed, ground grain screenings, clipped oat by-product, molasses and salt.
17.94	16.50	5.24	3.50	8.63	12.00	Same as sample No. 16307.
21.19	20.00	15.44	9.00	7.52	13.00	Corn oil cake meal and corn gluten feed.
9.31	10.00	4.27	3.50	3.02	10.00	Ground oats, ground barley, corn feed meal, wheat bran, ground corn bran, cottonseed meal and salt.
10.69	10.00	2.19	2.50	12.66	12.00	Ground alfalfa, corn, oats and molasses.
9.63	10.00	1.98	2.50	10.91	12.00	Same as sample No. 16116.
10.38	9.00	1.67	1.50	11.53	12.00	Same as sample No. 16116.
13.50	10.00	2.24	2.00	13.62	15.00	Alfalfa, molasses, cracked corn, barley and oats.
11.38	10.00	1.53	2.00	14.81	15.00	Same as sample No. 16296.
16.88	16.00	3.45	4.00	9.33	12.00	Ground wheat, barley, Kaffir corn, grain screenings, molasses, clipped oat by-product, cottonseed meal, corn gluten feed, alfalfa meal, linseed oil meal and salt.
12.00	10.00	1.93	1.00	10.52	12.00	Corn, oats, alfalfa meal, salt and molasses.
11.19	10.00	6.12	4.50	9.11	9.00	Corn oil meal, maize red dog flour, oat meal mill by-products (oat middlings, oat shorts, oat hulls) and salt. Ground corn and hominy feed identified but not guaranteed.
8.94	7.50	4.06	3.00	6.60	9.00	Corn, hominy feed and oat hulls. Cob meal identified but not guaranteed.
9.19	7.50	3.51	3.00	4.99	9.00	Corn, hominy feed and oat hulls.
12.56	10.00	1.92	2.00	13.52	15.00	Corn, oats, alfalfa meal and molasses.
11.50	10.00	1.87	2.00	14.34	15.00	Corn, oats, alfalfa meal and molasses. Barley identified but not guaranteed.
11.56	10.00	0.34	0.50	17.59	26.00	Alfalfa and molasses.
11.69	10.00	1.88	2.00	13.37	15.00	Alfalfa, molasses, cracked corn, barley and oats.
11.38	9.00	3.72	4.00	3.06	5.00	Rye, oats, corn, wheat screenings and wheat middlings.
8.88	7.00	4.02	3.00	6.61	9.00	Ground corn, oats, oat hulls and salt. Kaffir corn and flour middlings guaranteed but not identified.
9.13	7.00	3.77	3.00	6.20	9.00	Ground corn, Kaffir corn, oats, oat hulls and salt. Flour middlings guaranteed but not identified. Corn bran identified but not guaranteed.
10.13	9.00	4.40	3.00	5.38	9.00	Crushed oats, ground corn, corn bran and molasses. Crushed barley guaranteed but not identified.
10.38	9.00	4.79	3.00	6.41	9.00	Crushed oats, ground corn, corn bran, wheat bran, crushed barley and molasses.
11.75	9.00	3.36	4.00	6.67	9.00	Corn, Kaffir corn, oats, oat hulls, oat middlings, cottonseed meal and salt. Barley, red dog flour and hominy feed guaranteed but not identified. Corn bran identified but not guaranteed.
9.94	9.00	3.33	4.00	9.61	9.00	Corn, oats, red dog flour, oat hulls, oat middlings, cottonseed meal, Kaffir corn and salt. Barley and hominy feed guaranteed but not identified. Corn bran identified but not guaranteed.
10.00	9.00	2.33	2.00	9.59	14.00	Cracked corn, crushed oats, alfalfa meal, molasses and salt.
10.69	9.00	2.72	2.00	11.26	14.00	Same as sample No. 16134.

## FEED MIXTURES—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
160226	Globe Elevator Co., Buffalo, N. Y.—Continued. Anchor Dairy Feed.....	Hopewell .....	9.63
160283	Anchor Stock Feed.....	Columbus .....	10.74
16212	Golden Grain Milling Co., East St. Louis, Ill. Puritan Horse and Mule Feed.....	Mt. Holly .....	11.40
160198	Puritan Horse and Mule Feed.....	Salem .....	9.86
16581	D. H. Grandin Milling Co., Jamestown, N. Y. Grandin's Stock Food.....	Paterson .....	7.43
16291	Dwight E. Hamlin, Pittsburgh, Pa. H. & S. Horse, Mule and Dairy Feed.....	Trenton .....	15.15
16619	H. & S. Horse, Mule and Dairy Feed.....	Newark .....	8.35
160121	Hamlin's Pure Kain Molasses Feed.....	Villa Park .....	16.34
160417	H. & S. Alfalfa Feed.....	Trenton .....	9.11
16222	Howard H. Hanks Co., Chicago, Ill. Kingfalfa Horse Feed.....	Burlington .....	12.91
16235	Kingfalfa Horse Feed.....	Perth Amboy .....	10.56
16045	The H-O Company, Buffalo, N. Y. The H-O Co.'s Algrane Milk Feed.....	Red Bank .....	8.79
16173	Indiana Milling Co., Terre Haute, Ind. Sterling Feed .....	Jamesburg .....	8.42
16117	Kornfalfa Feed Milling Co., Kansas City, Mo. Kay Horse and Mule Feed.....	Camden .....	13.98
160120	Kornfalfa Kandy Feed.....	Manasquan .....	11.58
160389	Kornfalfa Kandy Feed.....	Camden .....	11.81
16495	Chas. A. Krause Milling Co., Milwaukee, Wis. Badger Horse Feed.....	Jersey City .....	10.68
16496	Derby Horse Feed.....	Jersey City .....	10.81
16558	Derby Horse Feed.....	Passaic .....	9.46
16364	Badger Dairy Feed.....	Plainfield .....	7.69
16669	Badger Dairy Feed.....	Hamburg .....	8.88
16670	Badger Stock Feed No. 2.....	Hamburg .....	7.93
16733	Badger Stock Feed No. 2.....	Boonton .....	7.39
16751	Badger Fancy Mixed Feed.....	Branchville .....	8.13
16030	Larowe Milling Co., Detroit, Mich. Larro Feed .....	Camden .....	9.55
160141	Larro Feed .....	Trenton .....	8.14
16166	Mingo .....	Englishtown .....	8.54

## FEED MIXTURES—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
15.06	16.00	2.82	3.50	10.97	12.00	Cottonseed meal, corn gluten feed, linseed oil meal, malt sprouts, brewers' dried grains, corn meal, corn bran, wheat middlings, ground grain screenings, clipped oat by-product, molasses and salt.
9.94	8.00	4.25	3.00	10.37	14.00	Ground oats, ground corn, ground wheat, barley screenings, clipped oat by-product, molasses and salt. Corn bran guaranteed but not identified.
11.81	9.00	1.80	1.50	11.66	14.00	Corn, oats, alfalfa, molasses and salt.
9.75	9.00	1.91	1.50	16.56	14.00	Same as sample No. 16212.
11.13	8.50	7.66	3.50	8.09	10.00	Oats, hominy feed, oat hulls and salt. Corn, barley and barley middlings guaranteed but not identified.
11.78	14.00	2.87	3.50	8.87	16.00	Alfalfa meal, molasses, brewers' dried grains and salt. Crushed flaxseed meal, old process oil meal and distillers' grains guaranteed but not identified.
17.38	14.00	3.03	3.50	9.98	16.00	Same as sample No. 16291.
6.38	5.00	1.51	1.50	5.31	8.00	Brewers' dried grains, distillers' grains from rye, and molasses.
14.88	14.00	2.72	3.50	12.44	16.00	Alfalfa meal, molasses and brewers' dried grains.
12.19	9.00	1.34	2.00	11.71	15.00	Alfalfa meal, cracked corn, oats and molasses.
11.63	9.00	1.79	2.00	13.00	15.00	Same as sample No. 16222.
19.25	14.00	2.99	4.00	10.84	10.00	Cottonseed meal, oat hulls, oat shorts, corn gluten feed, ground corn, ground grain screenings, molasses and salt. Wheat middlings and ground oats guaranteed but not identified.
10.00	10.00	2.50	3.00	15.66	16.00	Ground corn and cob and wheat bran.
13.19	9.00	1.95	1.50	10.49	15.00	Alfalfa meal, corn, oats and molasses.
11.50	9.00	2.00	2.50	10.01	12.00	Alfalfa meal, corn, oats and molasses.
11.19	9.00	1.75	2.50	12.08	12.00	Same as sample No. 160120.
10.81	10.00	2.35	2.00	10.02	12.00	Corn, oats, alfalfa meal, molasses and salt.
10.40	10.00	1.17	1.00	16.78	16.00	Corn, oats, alfalfa meal, molasses and salt.
9.56	10.00	0.96	1.00	20.42	16.00	Same as sample No. 16496.
18.25	16.00	3.81	2.00	13.73	15.00	Cottonseed meal, ground screenings from wheat, salt and molasses. Malt sprouts guaranteed but not identified. Clipped oat by-product identified but not guaranteed.
16.00	16.00	2.97	2.00	13.15	15.00	Cottonseed meal, ground screenings from wheat and oats, salt and molasses. Malt sprouts guaranteed but not identified.
9.44	10.00	5.47	4.50	10.86	12.00	Hominy feed, corn oil meal, maize red dog flour, oat meal mill by-product, oat middlings, oat hulls, oat shorts and salt.
9.81	10.00	5.22	4.50	11.38	12.00	Same as sample No. 16070.
13.38	12.50	6.83	4.00	3.87	9.00	Maize red dog flour, and wheat bran.
21.25	19.00	3.99	3.00	10.96	14.00	Cottonseed meal, corn gluten feed, distillers' dried grains mainly from corn, dried beet pulp, wheat bran, wheat middlings and salt.
20.06	19.00	3.64	3.00	12.43	14.00	Same as sample No. 16030.
25.94	25.00	3.90	4.00	12.29	12.00	Dried beet pulp, cottonseed meal, malt sprouts, corn gluten feed, linseed oil meal, wheat bran, distillers' dried grains mainly from corn, and salt.

## FEED MIXTURES—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>Meador-Atlas Co., New York City.</b>		
16373	Comal Horse Feed.....	Plainfield .....	16.04
	<b>Metropolitan Mills, New York City.</b>		
16164	Alpha-Grain Horse Feed.....	Englishtown .....	9.83
16348	Green Velvet Feed.....	Oradell .....	11.79
16417	Grainomo Feed .....	Ridgewood .....	12.81
16573	Grainomo Feed .....	Signac .....	7.09
	<b>Nowak Milling Corporation, Buffalo, N. Y.</b>		
16184	Pure Mo-Lene Horse Feed.....	Milltown .....	9.61
16320	Pure Mo-Lene Horse Feed.....	Trenton .....	8.04
16287	Justice Stock Feed.....	Hopewell .....	8.89
16185	Justice Stock Feed.....	Milltown .....	8.28
16563	Buffalo Horse Feed.....	Passaic .....	8.15
160079	Butterine Dairy Feed.....	Pennington .....	8.89
160272	Butterine Dairy Feed.....	Vineland .....	10.09
160337	Butterine Dairy Feed.....	Medford .....	8.47
160271	Justice Creamery Feed.....	Vineland .....	8.40
160317	Justice Creamery Feed.....	Mt. Holly .....	8.39
160315	Cream-O-Lene Dairy Ration.....	Mt. Holly .....	9.79
	<b>Omaha Alfalfa Milling Co., Omaha, Neb.</b>		
16040	Peerless Horse Feed.....	Red Bank .....	11.12
16762	Peerless Horse Feed.....	Newton .....	8.58
16636	Green Meadow Dairy Feed.....	Paterson .....	11.38
16620	Green Meadow Dairy Feed.....	Newark .....	9.57
160174	Cream Alfalfa Dairy Feed.....	Red Bank .....	12.43
160308	Al-corn-o Horse Feed.....	New Brunswick....	11.26
	<b>Park &amp; Pollard Co., Boston, Mass.</b>		
16414	Stock Feed .....	Ridgewood .....	7.91

## FEED MIXTURES—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
8.94	9.00	1.35	2.00	11.69	15.00	Cracked corn, whole oats, alfalfa meal and molasses.
11.44	9.00	1.97	2.00	13.89	15.00	Cracked corn, whole oats, alfalfa meal and molasses.
9.88	10.00	0.63	0.50	13.69	17.00	Alfalfa meal and molasses.
14.06	13.00	2.97	2.00	7.29	8.00	Brewers' dried grains and molasses.
16.94	13.00	2.92	2.00	8.29	8.00	Brewers' dried grains and molasses.
10.00	9.00	2.33	2.00	11.44	12.00	Cracked corn, crushed oats, whole oats, ground alfalfa, molasses and salt.
10.00	9.00	2.59	2.00	11.65	12.00	Same as sample No. 16184.
9.50	10.00	3.20	3.00	9.55	9.00	Ground oats, corn meal, wheat middlings, oat middlings, oat hulls, clipped oat by-product and salt. Linseed oil meal guaranteed but not identified.
9.25	10.00	3.64	3.00	10.52	9.00	Ground oats, corn meal, wheat middlings, oat middlings, oat hulls, clipped oat by-product and salt. Linseed oil meal guaranteed but not identified. Hominy feed identified but not guaranteed.
7.69	7.00	2.72	2.00	13.45	12.00	Ground oats, corn meal, oat hulls, clipped oat by-product, wheat middlings and salt. Hominy feed guaranteed but not identified.
16.81	17.50	5.29	4.00	13.29	12.00	Cottonseed meal, malt sprouts, brewers' dried grains, clipped oat by-product, ground grain screenings, molasses and salt.
14.56	17.50	4.77	4.00	13.03	12.00	Cottonseed meal, malt sprouts, brewers' dried grains, clipped oat by-product, ground grain screenings, molasses and salt. Ground corn identified but not guaranteed.
16.06	17.50	5.06	4.00	13.80	12.00	Cottonseed meal, malt sprouts, brewers' dried grains, clipped oat by-product, ground grain screenings, molasses and salt. Ground corn and ground Kaffir corn identified but not guaranteed.
23.00	22.00	5.51	4.00	11.09	9.00	Cottonseed meal, corn gluten feed, linseed oil meal, wheat middlings, corn distillers' dried grains, clipped oat by-product, malt sprouts, brewers' dried grains, ground wheat screenings and salt. Corn feed meal guaranteed but not identified.
21.50	22.00	5.50	4.00	12.03	9.00	Cottonseed meal, corn gluten feed, linseed oil meal, wheat middlings, corn distillers' dried grains, corn meal, clipped oat by-product, malt sprouts, brewers' dried grains, ground wheat screenings and salt.
19.06	20.00	4.75	4.00	9.28	9.00	Cottonseed meal, corn gluten feed, linseed oil meal, wheat middlings, corn distillers' grains, corn meal, malt sprouts, clipped oat by-product, brewers' dried grains, ground wheat screenings, molasses and salt. Ground Kaffir corn identified but not guaranteed.
9.13	10.00	1.99	2.00	9.78	12.00	Corn, oats, alfalfa meal and molasses.
9.31	10.00	1.97	2.00	9.56	12.00	Corn, oats, alfalfa meal and molasses.
9.84	11.00	0.56	1.00	15.03	25.00	Alfalfa meal and molasses.
9.08	11.00	0.57	1.00	18.04	25.00	Alfalfa meal and molasses.
16.81	16.00	2.45	2.50	9.54	18.00	Cottonseed meal, wheat bran, corn, alfalfa meal and molasses.
10.88	10.00	1.28	2.00	13.74	12.00	Corn, oats, alfalfa meal and molasses.
9.88	9.00	4.50	2.00	8.36	12.00	Ground corn, hominy feed, oats and oat hulls.

## FEED MIXTURES—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>M. C. Peters Mill Co., Omaha, Neb.</b>		
16033	Peters' Arab Horse Feed.....	Camden .....	9.69
160138	Peters' Arab Horse Feed.....	Trenton .....	8.62
16250	Peters' June Pasture .....	Woodbridge .....	8.63
16332	Peters' King Corn .....	Hackensack .....	9.90
16526	Peters' King Corn .....	Newark .....	9.58
160383	Peters' Repeter Horse Feed.....	Camden .....	11.72
160384	Peters' Rabbit Mule Feed.....	Camden .....	11.32
	<b>Phelps &amp; Sibley Co., Cuba, N. Y.</b>		
16345	Yellow P. & S. Feed.....	Westwood .....	9.79
16377	P. & S. White Feed.....	Palisade Park ....	9.34
	<b>Purity Oats Co., Davenport, Iowa.</b>		
16606	Iowa Stock Feed.....	Newark .....	7.39
	<b>Quaker Oats Co., Chicago, Ill.</b>		
16087	Schumacher Stock Feed.....	Long Branch ....	9.32
16517	Schumacher Feed .....	Jersey City .....	8.46
16360	Schumacher Feed .....	Plainfield .....	8.31
16089	Green Cross Horse Mixed Feed with Molasses.....	Long Branch ....	10.49
16794	Green Cross Horse Mixed Feed with Molasses.....	Millington .....	9.63
16845	Blue Ribbon Dairy Feed.....	Hackettstown ....	7.85
16975	Blue Ribbon Dairy Feed.....	Eatontown .....	8.40
16962	Quaker Dairy Feed with Molasses.....	Hope .....	8.72
16148	Quaker Dairy Feed with Molasses.....	Freehold .....	8.84
160075	Quaker Dairy Feed with Molasses.....	Lebanon .....	8.07
16154	Victor Feed .....	Freehold .....	7.80
16847	Victor Feed .....	Hackettstown ....	7.78

## FEED MIXTURES—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
11.00	9.00	2.95	2.00	9.01	15.00	Corn, oats, alfalfa meal and molasses.
11.25	9.00	2.65	2.00	9.88	15.00	Corn, oats, alfalfa meal and molasses.
12.69	10.00	0.92	0.50	18.18	26.00	Alfalfa meal and molasses.
11.81	9.00	1.62	1.50	10.95	18.00	Corn, oats, alfalfa meal and molasses.
11.06	9.00	1.69	1.50	11.71	18.00	Corn, oats, alfalfa meal and molasses.
12.44	9.00	1.86	1.50	11.27	18.00	Corn, oats, alfalfa meal and molasses.
10.31	9.00	1.43	1.50	12.07	18.00	Corn, oats, alfalfa meal and molasses.
8.13	7.00	3.55	3.00	10.56	9.00	Corn meal and oat hulls.
8.63	7.00	3.82	3.00	6.47	8.00	Ground white corn, hominy feed and oat hulls.
10.38	10.00	5.50	4.00	10.11	12.75	Wheat middlings, corn meal, hominy feed, oat meal mill by-product (oat shorts, oat hulls, oat middlings) and salt. <b>Brewers' dried grains guaranteed but not identified.</b>
11.38	10.00	4.00	3.25	9.83	10.00	Ground corn and barley, cottonseed meal, hominy feed, wheat middlings, oat meal mill by-product (oat middlings, oat hulls and oat shorts) and salt. <b>Ground puffed rice and puffed wheat guaranteed but not identified.</b>
10.81	10.00	4.06	3.25	9.56	10.00	Ground corn and barley, hominy feed, wheat flour, wheat middlings, cottonseed meal, oat meal mill by-product (oat middlings, oat hulls and oat shorts) and salt. <b>Ground puffed rice and puffed wheat guaranteed but not identified.</b> Ground Kaffir corn identified but not guaranteed.
11.00	10.00	3.88	3.25	9.38	10.00	Ground corn and barley, hominy feed, wheat flour, wheat middlings, cottonseed meal, oat meal mill by-product (oat middlings, oat hulls and oat shorts) and salt. <b>Ground puffed rice and puffed wheat guaranteed but not identified.</b>
10.00	10.00	2.58	2.50	11.42	12.00	Alfalfa meal, ground corn, crushed oats, molasses and cottonseed meal. <b>Oat meal mill by-product guaranteed but not identified.</b>
9.81	10.00	2.04	2.50	15.50	12.00	Alfalfa meal, ground corn, crushed oats, molasses, cottonseed meal and oat meal mill by-product (oat middlings, oat hulls and oat shorts).
24.06	25.00	4.55	3.50	10.60	12.00	Wheat bran, cottonseed meal, malt sprouts, molasses, hominy feed, linseed oil meal, oat meal mill by-product (oat middlings, oat hulls, oat shorts). <b>Small amount hominy feed identified but not guaranteed.</b>
20.19	25.00	4.33	3.50	11.73	12.00	Wheat bran, cottonseed meal, malt sprouts, molasses, hominy feed, linseed oil meal, oat meal mill by-product (oat middlings, oat hulls, oat shorts). <b>Corn germ meal identified but not guaranteed.</b>
15.19	16.00	4.15	4.00	12.59	14.50	Molasses, malt sprouts, cottonseed meal, ground grain screenings, linseed oil meal, oat meal mill by-product (oat middlings, oat hulls, oat shorts).
15.50	16.00	3.04	4.00	7.85	14.50	Molasses, cottonseed meal, ground grain screenings, clipped oat by-product and linseed oil meal. <b>Malt sprouts guaranteed but not identified.</b>
15.38	16.00	3.58	4.00	12.57	14.50	Same as sample No. 16962.
9.94	8.00	5.00	3.00	8.34	12.00	Ground corn, hominy feed, oat meal mill by-product (oat middlings, oat hulls and oat shorts) and salt.
8.19	8.00	3.55	3.00	9.41	12.00	Same as sample No. 16154.

## FEED MIXTURES—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>Quaker Oats Co., Chicago, Ill.—Continued.</b>		
16209	Vim Feed .....	Mt. Holly .....	6.02
16274	Buckeye Feed .....	Hopewell .....	7.68
16576	Buckeye Feed .....	Little Falls .....	8.04
16950	Buckeye Feed .....	Neshanic .....	7.94
160168	White Diamond Feed.....	Woodstown .....	8.41
	<b>Ralston-Purina Co., St. Louis, Mo.</b>		
16054	Purina Dairy Feed .....	Red Bank .....	9.90
16595	Purina Dairy Feed .....	Newark .....	7.65
16082	Purina Sweet Feed .....	Camden .....	12.57
16589	Purina Sweet Feed .....	Paterson .....	7.90
16097	Good Luck Feed with Molasses.....	Manasquan .....	13.36
16514	Good Luck Feed with Molasses.....	Jersey City .....	10.14
160153	Good Luck Feed with Molasses.....	Trenton .....	10.48
16175	Purina Chow Chow Feed.....	Jamesburg .....	7.15
16651	Purina Chow Chow Feed.....	Sussex .....	12.62
16208	Protena Dairy Feed.....	Mt. Holly .....	7.00
160083	Protena Dairy Feed.....	Titusville .....	6.95
16511	O. K. Feed with Molasses.....	Jersey City .....	11.84
160154	Star Feed with Molasses.....	Trenton .....	10.30
16513	Star Feed with Molasses.....	Jersey City .....	10.45
16593	Purina Feed with Molasses.....	Newark .....	10.92
16146	Purina Feed with Molasses.....	Freehold .....	10.37
	<b>Republic Milling Co., East St. Louis, Ill.</b>		
16319	Leader Horse Feed.....	Trenton .....	9.18
160231	Republic Dairy Feed.....	Greenwich .....	7.59
160151	Republic Horse Feed.....	Trenton .....	9.52
	<b>S. F. Scattergood &amp; Co., Philadelphia, Pa.</b>		
16744	Scattergood Stock Feed.....	Lafayette .....	7.22
	<b>E. L. Shute &amp; Co., Philadelphia, Pa.</b>		
160368	Pippin Horse Feed.....	Camden .....	11.87
	<b>Sugarine Co., Peoria, Ill.</b>		
160148	Sugarine Dairy Feed.....	Trenton .....	10.08
160239	Sugarine Dairy Feed.....	Bridgeton .....	7.96
160149	Sugarine Horse Feed with Alfalfa.....	Trenton .....	9.78
160237	Ideal Sugared Feed.....	Bridgeton .....	9.80
	<b>Thompson &amp; Mould, Goshen, N. Y.</b>		
16653	Mixed Feed .....	Sussex .....	8.71

## FEED MIXTURES—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
5.50	5.00	2.08	2.00	26.35	28.00	Oat meal mill by-product (oat middlings, oat hulls and oat shorts).
14.94	15.50	4.95	4.50	8.05	8.50	Wheat bran and wheat middlings. Rye shorts guaranteed but not identified.
15.25	15.50	5.07	4.50	8.83	8.50	Wheat bran, wheat middlings and rye shorts.
15.25	15.50	5.55	4.50	8.56	8.50	Same as sample No. 16576.
9.38	8.00	4.47	3.25	7.86	9.00	Ground corn, hominy feed, oat meal mill by-products (oat middlings, oat hulls, oat shorts) and salt. Ground barley identified but not guaranteed.
21.50	20.00	3.46	3.50	12.37	15.00	Cottonseed meal, brewers' dried grains, corn gluten feed, ground alfalfa, molasses and salt.
22.25	20.00	3.78	3.50	13.04	15.00	Same as sample No. 16054.
10.50	9.00	0.95	1.00	17.64	18.00	Ground alfalfa, molasses and salt.
9.56	9.00	0.73	1.00	23.10	18.00	Same as sample No. 16082.
10.06	9.00	1.44	1.50	13.88	12.00	Cracked corn, whole oats, ground alfalfa, molasses and salt.
8.68	9.00	1.87	1.50	12.76	12.00	Same as sample No. 16097.
8.25	9.00	1.77	1.50	11.95	12.00	Same as sample No. 16097.
24.38	24.00	3.82	5.00	15.25	12.00	Cottonseed meal, corn gluten feed, brewers' dried grains, molasses, ground alfalfa and salt.
23.38	24.00	4.22	5.00	13.06	12.00	Same as sample No. 16175.
15.81	16.50	5.49	3.50	12.81	12.00	Cottonseed meal, brewers' dried grains, clipped oat by-product, ground wheat screenings, molasses and salt.
14.81	16.50	3.87	3.50	17.26	12.00	Same as sample No. 16208.
8.69	9.00	1.67	1.50	11.37	12.00	Corn, whole oats, ground alfalfa, molasses and salt.
8.19	9.00	2.54	1.50	9.66	12.00	Cracked corn, whole oats, ground alfalfa, molasses and salt.
8.56	9.00	2.45	1.50	8.36	12.00	Same as sample No. 160154.
8.44	9.30	1.92	1.70	10.77	11.70	Cracked corn, oats, ground alfalfa, molasses and salt.
8.69	9.30	2.16	1.70	10.31	11.70	Same as sample No. 16593.
9.31	9.00	1.91	2.00	14.22	12.00	Corn, oats, alfalfa meal, ground wheat screenings, molasses and salt.
15.88	16.50	3.98	3.00	12.44	12.00	Cottonseed meal, malt sprouts, alfalfa meal, ground wheat screenings, molasses and salt.
10.50	9.00	1.70	2.00	15.35	12.00	Corn, oats, alfalfa meal, molasses and salt.
10.31	10.00	5.12	4.00	11.27	12.75	Wheat middlings, corn meal, hominy feed, oat meal mill by-product (oat shorts, oat hulls, oat middlings) and salt. Brewers' dried grains guaranteed but not identified.
8.69	9.00	1.08	1.50	14.43	15.00	Alfalfa meal, corn, oats and molasses.
15.25	16.50	4.49	3.50	13.08	12.00	Molasses, cottonseed meal, corn gluten feed, ground grain screenings, clipped oat by-product, linseed oil meal and salt.
19.75	16.50	6.54	3.50	10.32	12.00	Same as sample No. 160148.
9.75	10.00	2.46	2.50	10.57	12.00	Molasses, alfalfa meal, corn, oats, barley and salt.
12.69	12.00	4.62	2.50	10.76	12.00	Molasses, ground grain screenings, clipped oat by-product, cottonseed meal and salt.
15.81	14.00	3.92	3.50	5.98	7.50	Wheat bran, wheat middlings and wheat screenings. Corn bran guaranteed but not identified.

## FEED MIXTURES—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16754	Ubiko Milling Co., Cincinnati, O. Ubiko Union Grains—Biles Ready Dairy Ration.....	Andover .....	6.92
160244	Ubiko Union Grains—Biles Ready Dairy Ration.....	Bridgeton .....	6.36
160246	Ubiko Horse and Stock Feed.....	Bridgeton .....	8.54
16759	United States Sugar Feed Co., Milwaukee, Wis. U. S. Sugared Feed.....	Newton .....	10.39
16711	U. S. Sugared Feed.....	Sussex .....	6.85
16565	Wash Co. Alfalfa Milling Co., Fort Calhoun, Neb. Practical Horse Feed.....	Passaic .....	11.50
16663	Western Grain Products Co., Hammond, Ind. Hammond Dairy Feed.....	Hamburg .....	9.42
160394	Hammond Dairy Feed.....	Mullica Hill .....	8.98
16450	Western Grain and Sugar Product Co., San Francisco, Cal. Vigorator .....	Townley .....	10.95
16453	Barvig .....	Townley .....	10.00
16990	J. M. Wyckoff, East Stroudsburg, Pa. Mixed Feed .....	Delaware .....	10.75

## CALF MEALS.

160373	American Milling Co., Peoria, Ill. Sucrene Calf Meal.....	Swedesboro .....	9.10
16778	Arcady Farms Milling Co., Rondout, Ill. Arcady Calf Meal.....	Dover .....	9.48
160111	Frank Bird, Flemington, N. J. Cereal Calf Meal.....	Flemington .....	8.36
16749	Blatchford Calf Meal Factory, Waukegan, Ill. Blatchford Calf Meal.....	Branchville .....	9.01
160278	Clover Leaf Milling Co., Buffalo, N. Y. Clover Leaf Calf Meal.....	Columbus .....	8.94
16892	Quaker Oats Co., Chicago, Ill. Schumacher Calf Meal.....	Bound Brook .....	7.52
16737	Ryde & Co., Chicago, Ill. Ryde's Cream Calf Meal.....	Boonton .....	7.83

## FEED MIXTURES—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
23.63	24.00	7.48	7.00	8.98	9.00	Corn distillers' dried grains, cottonseed meal, linseed oil meal, wheat middlings, wheat bran, hominy feed, brewers' dried grains, barley, malt sprouts and salt.
24.00	24.00	7.09	7.00	9.51	9.00	Same as sample No. 16754.
17.81	16.00	7.11	6.00	7.52	9.00	Wheat middlings, hominy feed, wheat bran, brewers' dried grains and linseed oil meal.
14.38	15.00	2.27	3.00	10.82	12.00	Cottonseed meal, malt sprouts, oat clips, molasses, salt and screenings from oats, barley and wheat.
16.19	15.00	3.58	3.00	12.86	12.00	Same as sample No. 16759.
12.06	8.00	1.38	1.50	12.64	15.00	Corn, alfalfa meal and molasses.
16.81	16.50	3.70	3.50	10.42	11.00	Cottonseed meal, malt sprouts, clipped oat by-product, ground grain screenings and molasses. Corn distillers' grains guaranteed but not identified.
15.81	16.50	4.94	3.50	11.95	11.00	Cottonseed meal, corn distillers' grains, malt sprouts, clipped oat by-product, ground grain screenings, molasses and salt.
10.94	9.50	1.03	0.75	16.69	20.00	Alfalfa meal and molasses.
10.81	10.00	1.28	1.10	13.59	13.50	Alfalfa meal, barley and molasses.
11.56	6.00	3.55	2.00	3.15	9.00	Rye middlings, oats, Kaffir corn and corn. Rye bran guaranteed but not identified. Barley identified but not guaranteed.

## CALF MEALS.

19.88	20.00	4.59	4.00	3.75	3.00	Blood flour, malt flour, dried skimmed milk, corn meal, linseed oil meal, wheat middlings. Rice identified but not guaranteed. Bone meal guaranteed but not identified.
25.19	25.00	4.70	5.00	5.54	7.00	Wheat flour, malt flour, powdered milk, linseed oil meal, cottonseed meal and salt.
13.25	14.00	4.68	4.00	1.95	3.00	Rolled oats, wheat, rice, corn and burnt popcorn.
25.06	24.00	4.30	5.00	5.59	6.75	Locust bean meal, flaxseed, wheat flour, barley meal, ground beans and peas, rice polish, linseed oil meal, cocoa shell meal, coconut meal, cottonseed meal, foenugreek, dried milk, anise and salt.
26.06	25.00	5.05	6.00	5.31	7.00	Pulverized malt flour, wheat flour, linseed oil meal, cottonseed meal and salt.
18.63	19.00	8.12	8.00	2.76	3.00	Oat meal, ground flaxseed, dried casein and cottonseed meal. Wheat meal and bicarbonate of soda guaranteed but not identified.
24.56	25.00	5.51	5.00	5.37	6.00	Carob beans, flaxseed, wheat flour, cottonseed meal, beans, lentils, foenugreek, cocoa meal and salt. Anise, guaranteed but not identified.

## FEED MIXTURES (NEW JERSEY MANUFACTURERS).

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
160023	W. N. Adair & Co., Raritan, N. J. Mixed Feed .....	Raritan .....	12.60
16886	D. C. Apgar, Ralston, N. J. Pure Feed .....	Ralston .....	12.31
16851	Warren Beaty, Hackettstown, N. J. Mixed Feed .....	Hackettstown .....	12.18
16763	Belvidere Flouring Mill Co., Belvidere, N. J. Mixed Feed .....	Newton .....	10.33
160109	Frank Bird, Flemington, N. J. Dairy Feed .....	Flemington .....	10.03
160112	Cereal Pig Feed.....	Flemington .....	7.39
16406	H. H. Blauvelt, Ridgewood, N. J. Horse Feed .....	Ridgewood .....	12.51
16407	Cow Feed .....	Ridgewood .....	10.85
16547	Campbell, Morrell & Co., Passaic, N. J. Ground Horse Feed.....	Passaic .....	10.24
16516	Carscallen & Cassidy, Jersey City, N. J. Ground Feed .....	Jersey City .....	10.73
160045	The Clinton Mills, Clinton, N. J. Mixed Feed No. 2.....	Clinton .....	11.36
16119	J. S. Collins & Son, Inc., Moorestown, N. J. Cow Feed .....	Moorestown .....	9.55
16122	Horse Feed .....	Moorestown .....	9.40
16819	J. M. Conover & Son, Bartley, N. J. Conover's Horse Feed.....	Bartley .....	9.89
16956	Thos. Craig, Buttzville, N. J. Mixed Feed .....	Buttzville .....	12.55
16454	A. D. Crane, Elizabeth, N. J. Horse Feed .....	Roselle Park .....	11.53
16800	Crane Bros., Murray Hill, N. J. Home Made Feed.....	Murray Hill .....	10.89
16741	C. H. Crisman, Branchville, N. J. Rye, Oats, Corn and Barley.....	Branchville .....	12.28
160035	Willard Curtis, Milford, N. J. Mixed Feed .....	Everittstown .....	11.06
16254	W. A. Crowell, Metuchen, N. J. Feed .....	Metuchen .....	11.11
16483	A. Cyphers Co., Newark, N. J. Ground Feed .....	Newark .....	10.34
16484	Cypho Dairy Feed.....	Newark .....	8.49
16290	J. S. Darnell, Trenton, N. J. Mixed Horse Feed.....	Trenton .....	10.45
16709	Decker & Simmons, Sussex, N. J. D. & S. Rye, Oats and Corn Horse Feed.....	Sussex .....	11.55

## FEED MIXTURES (NEW JERSEY MANUFACTURERS).

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
9.38	8.00	3.23	3.00	2.12	8.00	Corn, oats, wheat and rye.
10.00	10.00	4.72	4.50	3.00	5.00	Shelled corn, oats and wheat bran.
9.13	7.00	3.26	3.00	4.86	10.00	Corn, cob meal, rye, oats and wheat bran.
11.75	8.00	2.38	2.40	3.51	20.00	Rye bran and rye middlings. Corn and oats guaranteed but not identified.
11.81	16.00	3.96	4.00	10.90	8.00	Corn meal, ground oats and wheat bran. Buckwheat feed guaranteed but buckwheat middlings and buckwheat hulls identified. Wheat middlings identified but not guaranteed.
14.44	16.00	4.02	4.00	3.00	4.00	Buckwheat middlings, pea meal, wheat middlings, corn meal and popcorn.
9.81	10.00	4.54	3.64	2.64	3.50	Corn, rye and oats.
16.81	15.50	4.47	3.90	4.63	2.70	Wheat bran, linseed oil meal, wheat middlings, corn gluten feed, corn meal and crushed oats. Cottonseed meal identified but not guaranteed.
10.88	7.00	4.13	3.00	4.00	4.50	Wheat middlings, corn meal and ground oats. Hominy meal, rice meal and oat screenings guaranteed but not identified.
11.00	7.00	3.54	3.00	1.76	8.00	Oats, corn, wheat and barley.
9.50	9.50	3.69	2.90	4.98	5.00	Corn and cob meal, oats and rye.
15.25	17.00	5.15	4.00	5.30	5.00	Corn bran, corn gluten feed, cottonseed meal, corn meal and wheat bran.
11.69	10.00	4.85	4.00	6.90	4.00	Cracked corn, wheat bran, corn bran, oats and alfalfa.
11.25	10.00	6.08	5.25	4.25	8.65	Hominy feed, ground corn and cob, ground oats, rye and wheat middlings.
10.13	8.00	2.87	2.00	3.98	8.00	Corn and cob meal, oats and rye.
9.88	8.00	4.00	2.00	2.25	8.00	Ground corn and oat feed.
9.81	6.00	4.18	3.00	4.91	10.00	Corn and oats. Oat hulls guaranteed but not identified.
10.81	10.00	2.86	3.00	2.97	5.00	Rye, oats, corn and barley.
9.25	9.25	3.34	3.65	2.60	2.50	Rye, corn and oats.
8.75	9.10	3.71	4.00	2.43	3.10	Corn and oats. Rye identified but not guaranteed.
9.63	7.00	5.44	2.00	2.82	15.00	Ground corn, ground oat hulls and ground corn bran.
19.56	16.00	4.89	5.00	9.01	15.00	Corn gluten feed, linseed oil meal, buckwheat middlings, buckwheat hulls, cottonseed meal, ground corn bran and salt.
11.00	9.03	4.73	4.00	4.87	5.60	Cracked corn, wheat bran and oats.
9.94	8.00	3.38	3.00	2.89	4.00	Rye, oats and corn.

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
160402	C. C. Dempsey & Co., Gloucester, N. J. West Jersey Horse Feed.....	Gloucester .....	10.04
160403	West Jersey Cow Feed.....	Gloucester .....	8.38
160067	L. W. Dorland, High Bridge, N. J. Dorland's Mixed Feed.....	High Bridge .....	12.13
16837	G. W. Fisher, Port Murray, N. J. Pearl Mixed Feed.....	Port Murray .....	9.57
16394	B. Flecke, Englewood, N. J. Ground Feed .....	Englewood .....	10.28
160072	Flemington Milling Co., Flemington, N. J. Mixed Feed .....	Flemington .....	10.76
16785	Jos. Gardner, Dover, N. J. Star Horse Feed.....	Dover .....	9.12
16830	John D. Gibbs, Vienna, N. J. Gibbs' Horse Feed.....	Vienna .....	12.20
16823	Geo. W. Hand, Flanders, N. J. Grade No. 1 Feed.....	Flanders .....	11.51
16504	A. Hanniball, Hoboken, N. J. Hanniball's All Grain Molasses Feed.....	Hoboken .....	10.21
16662	Reeve Harden, Hamburg, N. J. Rye, Oats and Corn Chop.....	Hamburg .....	11.54
16608	Harrison Co., Caldwell, N. J. Harrison Horse Feed.....	Caldwell .....	9.82
16615	Harrison Milling Co., Montclair, N. J. Dairy Feed .....	Montclair .....	9.19
16616	Horse Feed .....	Montclair .....	8.15
160106	Geo. C. Higgins & Son, Three Bridges, N. J. Feed .....	Three Bridges ....	11.15
16874	G. W. Hildebrant, Pottersville, N. J. Horse Feed .....	Pottersville .....	10.83
16825	M. R. Hildebrant, Flanders, N. J. Eagle Brand Horse Feed.....	Flanders .....	9.74
16681	I. A. Hoffman & Son, German Valley, N. J. Hoffman's King Feed.....	Morristown .....	11.13
16335	Holley & Smith, Hackensack, N. J. Ground Feed .....	Hackensack .....	9.93
16752	Hopkins, Hough & Merrill Co., Branchville, N. J. No. 1 Horse Feed.....	Branchville .....	10.69
160039	W. F. Hummer, Milford, N. J. Mixed Feed .....	Mt. Pleasant ....	11.32
16979	W. I. Jacoby, Finesville, N. J. Mixed Feed .....	Finesville .....	10.46
16726	The Jaqui Co., Morristown, N. J. Horse Feed .....	Morristown .....	11.29

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
14.31	14.00	5.06	5.00	5.79	7.00	Cracked corn, wheat bran, brewers' dried grains, wheat middlings and salt. Alfalfa meal guaranteed but not identified.
22.75	18.00	4.45	4.00	9.74	8.00	Corn gluten feed, brewers' dried grains, wheat bran, wheat middlings and salt. Buckwheat middlings guaranteed but not identified.
7.81	9.13	3.74	3.04	5.94	4.55	Corn meal, oats and corn bran. Rye guaranteed but not identified.
9.81	8.75	3.79	3.00	6.35	7.00	Corn, cob meal, wheat middlings, buckwheat middlings and oats. Hominy feed guaranteed but not identified.
11.88	8.00	4.22	4.00	3.59	9.00	Corn, oats, wheat bran and wheat middlings.
10.44	8.75	4.17	2.90	5.01	5.49	Corn and oats. Rye identified but not guaranteed.
12.50	7.00	6.07	3.00	3.09	10.00	Hominy feed, cob meal, oats, corn, and wheat middlings.
8.81	7.44	3.13	1.69	3.80	5.98	Corn and cob meal, rye and oats.
8.44	9.00	3.13	3.15	5.24	6.00	Corn and cob meal, rye and oats.
11.19	10.00	3.13	4.00	10.13	8.00	Alfalfa meal, molasses, cracked corn and oats.
10.25	9.00	3.02	3.00	3.01	6.00	Rye, oats and corn.
10.75	9.00	5.99	5.00	4.82	7.00	Oats, corn, hominy feed, oat hulls and corn bran.
18.25	20.00	4.91	5.00	5.30	6.00	Corn gluten feed, wheat middlings, wheat bran, hominy feed, cottonseed meal, red dog flour and corn meal.
11.25	9.00	7.58	5.00	4.79	7.00	Oats, corn, hominy feed, oat hulls and corn bran.
9.19	8.75	3.93	4.41	2.38	1.95	Corn, oats, rye and wheat middlings. Wheat guaranteed but not identified.
8.94	.....	3.39	.....	4.57	.....	Corn and cob meal, oats and rye.
10.81	9.00	6.71	3.25	3.50	6.00	Corn and cob meal, rye, oats and rye bran. Wheat middlings guaranteed but not identified.
9.56	8.50	3.47	3.05	4.84	8.00	Corn and cob meal, oats and rye.
10.75	7.00	4.29	3.00	5.34	4.65	Hominy feed, corn cob meal, corn and oats.
11.13	10.88	5.39	5.50	4.02	6.41	Corn, oats and barley. Wheat bran identified but not guaranteed.
10.56	9.80	3.14	2.70	2.89	2.80	Oats, rye and corn. Corn ears, rye middlings and hominy guaranteed but not identified.
10.81	6.00	3.65	4.00	3.29	7.00	Corn, oats, rye middlings, wheat middlings and cob meal.
10.88	9.00	4.19	3.25	4.43	4.00	Oats, corn and grain screenings.

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16996	I. B. Keener, Belvidere, N. J. Feed .....	Belvidere .....	11.11
16970	J. M. Kostenbader, Delaware, N. J. Mixed Feed .....	Delaware .....	14.69
160332	Kirby Bros., Medford, N. J. Dairy Feed .....	Medford .....	10.37
160335	C. H. Kirby, Medford, N. J. Dairy Feed .....	Medford .....	10.61
16680	C. L. Lade, Morristown, N. J. Lade's Horse Feed .....	Morristown .....	11.58
16920	J. P. Larison, Washington, N. J. Mixed Feed .....	Washington .....	9.51
160060	Lebanon Valley Mills, Lebanon, N. J. Corn, Rye and Oats Feed .....	Lebanon .....	9.92
16739	C. H. Leonard Co., Boonton, N. J. Stock Feed .....	Boonton .....	8.43
16766	Lunger Grain and Elevator Co., Netcong, N. J. No. 1 Horse Feed .....	Netcong .....	10.59
16768	Perfection Cow Feed .....	Netcong .....	9.22
16427	J. A. Lydecker, Paterson, N. J. J. A. L. Feed .....	Paterson .....	9.03
160069	G. G. MacPherson, Lebanon, N. J. No. 2 Mixed Feed .....	Lebanon .....	12.99
160002	McMurtrie Milling Co., Belvidere, N. J. Horse Feed .....	Belvidere .....	12.06
16650	The Manning Co., Sussex, N. J. Horse Feed .....	Sussex .....	10.95
16973	Messler & Shannon, Blairstown, N. J. M. & S. Horse Feed .....	Blairstown .....	11.84
16644	Meyer & De Vogel, Paterson, N. J. M. & D. Horse Feed .....	Paterson .....	7.51
16863	H. N. Miller, Peapack, N. J. Corn and Oats .....	Peapack .....	12.10
16866	Horse Feed .....	Peapack .....	11.03
16443	A. J. Mowerson & Co., Wyckoff, N. J. Horse Feed .....	Wyckoff .....	8.88
16858	Neighbor & Son, Califon, N. J. Horse Feed .....	Califon .....	10.14
16821	J. H. Nunn, Bartley, N. J. Horse Feed .....	Bartley .....	10.06
16638	Peter O'Brien, Paterson, N. J. O. B. Feed .....	Paterson .....	7.80
16349	Oradell Flour, Feed and Grain Co., Oradell, N. J. Oradell Cow Feed .....	Oradell .....	9.67
16396	J. I. Pickens, Ridgefield, N. J. Soft Feed .....	Ridgefield .....	9.33

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
11.44	8.00	3.32	2.00	3.81	10.00	Corn, oats and rye.
8.94	6.00	2.52	2.00	3.55	20.00	Corn and cob meal, oats and rye.
15.88	12.00	2.65	3.00	9.49	12.00	Rye bran, brewers' dried grains, malt sprouts, corn and cob meal, corn gluten feed, ground rye screenings and corn bran. Beet pulp, cottonseed meal and oats identified but not guaranteed.
10.75	13.25	3.06	2.50	7.99	6.50	Malt sprouts, corn and cob meal, corn bran and beet pulp. Wheat bran, wheat middlings, rye middlings and buckwheat hulls identified but not guaranteed. Rye bran guaranteed but not identified.
9.94	8.30	3.73	3.20	3.31	6.70	Corn and cob meal, oats and rye.
9.38	10.00	3.35	4.00	5.32	8.00	Corn and cob meal, rye middlings, wheat and oats.
9.94	9.94	3.79	3.79	2.47	2.47	Corn and cob meal, rye and oats.
11.81	10.00	6.30	4.50	7.51	8.00	Hominy feed, corn meal, oat hulls and oat middlings, red dog flour and wheat middlings.
11.44	10.00	5.04	4.00	2.68	9.00	Hominy feed, oats and wheat middlings. Ground corn identified but not guaranteed.
14.81	16.00	2.83	3.50	7.23	12.00	Wheat bran, wheat middlings, corn gluten feed, corn and cob meal, brewers' dried grains and salt.
9.19	8.25	6.48	5.14	10.48	12.34	Hominy feed, cob meal, salt, corn and oat feed.
10.88	8.75	3.94	3.00	5.50	6.50	Corn and cob meal, oats and rye. Clover seed identified but not guaranteed.
13.63	8.00	4.12	2.00	5.03	8.00	Oats, rye, corn and cob meal.
10.44	10.00	4.49	3.50	4.60	3.90	Corn, rye and oats.
10.50	8.50	3.46	3.00	4.14	6.50	Corn and cob meal, oats, rye and wheat feed.
8.63	6.50	6.48	4.50	12.29	14.50	Hominy feed, cob meal, salt and oat feed.
9.56	9.19	3.73	3.94	2.58	2.81	Corn and oats. Rye and small amount of barley identified but not guaranteed.
9.13	8.81	3.51	2.96	3.96	5.36	Corn and cob meal, oats and rye.
10.56	9.00	6.15	4.00	10.29	3.00	Wheat middlings, oats and hominy feed. Cob meal identified but not guaranteed.
8.50	8.06	3.36	3.32	5.89	6.14	Corn and cob meal, oats and rye.
8.19	9.00	3.53	3.00	6.37	6.00	Corn and cob meal, rye and oats.
9.25	7.00	5.94	4.00	12.36	10.00	Hominy feed, cob meal, salt, wheat bran and wheat middlings. Oat feed guaranteed but not identified. Oat hulls identified but not guaranteed.
12.63	11.00	5.26	3.93	5.19	5.25	Corn meal, wheat middlings and crushed oats. Wheat bran guaranteed but not identified.
12.56	13.00	4.39	4.00	7.25	8.00	Corn meal, wheat middlings, wheat bran, crushed oats and alfalfa meal. Hominy feed guaranteed but not identified.

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16692	Est. of H. L. Pierson, South Orange, N. J. Perfection Cow Feed.....	Maplewood .....	8.86
16402	W. V. Pulis, Campgaw, N. J. Horse Feed .....	Campgaw .....	11.45
160080	H. E. & W. C. Reed, Trenton, N. J. Reed's Mixed Horse Feed.....	Ewingville .....	11.00
16297	C. A. & T. P. Reed, Pennington, N. J. Alfalfa Dairy Feed.....	Pennington .....	7.17
16298	Alfalfa Horse Feed.....	Pennington .....	8.26
160015	F. I. Reger, Somerville, N. J. Corn, Oats and Rye.....	Somerville .....	11.97
160057	W. H. Reger & Son, White House, N. J. Mixed Feed .....	White House .....	11.89
16266	J. M. Reuter & Co., Elizabeth, N. J. Ground Feed .....	Rahway .....	10.86
16462	Ground Feed .....	Elizabeth .....	9.37
16769	The Geo. Richards Co., Dover, N. J. Richards' Dairy Feed.....	Dover .....	7.60
16773	Richards' Stock Feed.....	Dover .....	9.19
16774	Richards' Horse Feed.....	Dover .....	9.35
16984	J. L. Riegel & Son, Riegelsville, N. J. Mixed Chop .....	Riegelsville .....	10.00
16452	Chas. Schaefer & Son, Townley, N. J. C. S. & S. Horse Feed.....	Townley .....	10.80
16264	W. Schlesinger, New Brunswick, N. J. Corn, Oats and Rye Feed.....	New Brunswick .....	10.69
16072	Sharpless & Bro., Camden, N. J. Royal Molasses Horse Feed.....	Camden .....	11.24
16073	No. 2 Dairy Feed.....	Camden .....	10.14
16912	S. A. Shillinger, Stewartsville, N. J. Horse Feed .....	Stewartsville .....	11.40
16532	M. W. Simonson Co., Newark, N. J. Feed .....	Newark .....	9.09
16574	S. Sindle & Son, Little Falls, N. J. Ground Horse Feed.....	Little Falls .....	10.83
16061	Sitley & Son, Inc., Camden, N. J. Peerless Alfalfa Horse Feed.....	Camden .....	11.55
16064	Cloverdale Alfalfa Horse Feed.....	Camden .....	12.04
16065	S. & S. Molasses Horse and Mule Feed.....	Camden .....	11.74
16124	Peerless Dairy Feed.....	Camden .....	10.58
16125	Peerless Alfalfa Cattle Feed.....	Camden .....	7.73
160091	Jos. Smith & Co., Stockton, N. J. Mixed Feed .....	Stockton .....	11.81

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
16.38	16.50	4.41	4.50	9.12	10.00	Alfalfa meal, wheat bran, wheat middlings, corn gluten feed, cottonseed meal, linseed oil meal and corn meal.
11.69	.....	4.34	.....	4.11	.....	Corn, oats, wheat bran and wheat middlings.
10.81	9.50	4.62	3.00	3.41	5.00	Cracked corn, oats and wheat bran.
21.63	20.06	4.67	4.34	12.13	15.00	Corn gluten feed, linseed oil meal, wheat bran, brewers' dried grains, beet pulp, cottonseed meal and alfalfa meal. Corn and oats guaranteed but not identified. Malt sprouts identified but not guaranteed.
10.13	11.00	3.86	4.00	7.06	5.00	Oats, wheat bran, alfalfa, cracked corn and molasses.
9.13	10.00	3.65	4.20	3.26	7.10	Corn, oats and rye.
9.25	8.94	3.77	3.61	2.49	2.02	Corn, oats and rye.
10.19	8.00	4.00	3.00	3.70	10.00	Corn, oats and oat hulls. Barley guaranteed but not identified.
10.13	8.00	3.36	3.00	4.51	10.00	Corn, oats, oat hulls and barley.
20.25	20.00	4.83	4.00	6.12	8.00	Wheat bran, corn meal, wheat middlings, cottonseed meal, wheat meal, linseed oil meal, hominy feed and corn gluten feed.
10.69	10.00	3.22	3.50	6.24	8.00	Oats, barley, corn, hominy feed and rye. Oat hulls, Kaffir corn, peas and wheat middlings identified but not guaranteed.
11.31	11.00	3.69	4.00	3.97	6.50	Corn, oats, rye, barley and wheat.
10.03	7.31	3.59	2.49	2.89	3.07	Rye, corn, oats, hominy feed and wheat middlings.
10.63	8.00	1.50	1.50	14.19	12.00	Alfalfa meal, corn, oats, molasses and salt.
10.00	9.70	3.85	3.60	2.70	2.35	Corn, oats and rye.
9.63	8.00	2.59	2.00	11.26	15.00	Corn, oats, alfalfa meal and molasses.
10.88	9.50	3.85	2.00	5.04	15.00	Corn meal, malt sprouts, corn bran and oat hulls.
9.56	9.75	3.34	2.89	1.83	1.52	Corn, oats, rye and wheat.
6.81	6.94	2.07	2.00	14.31	10.69	Oats and oat hulls, corn and cob meal.
11.06	11.13	5.13	4.27	3.92	3.99	Rye, oats and corn.
10.19	9.00	2.88	2.00	7.08	15.00	Alfalfa meal, corn, oats and molasses.
11.19	8.00	1.60	2.00	10.89	15.00	Alfalfa meal, corn, oats and molasses.
10.06	6.00	1.97	2.00	13.03	15.00	Alfalfa meal, corn and molasses. Oat screenings guaranteed but not identified. Small quantity of oats present.
9.75	9.00	4.57	4.00	3.90	10.00	Corn, oats and oat screenings.
21.38	16.00	2.96	3.50	9.76	13.00	Alfalfa meal, brewers' dried grains, cottonseed meal, molasses and corn gluten feed. Wheat bran identified but not guaranteed.
10.30	7.00	4.03	3.00	3.35	6.00	Corn, oats, rye and buckwheat. Corn bran guaranteed but not identified.

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>J. C. Smith &amp; Wallace Co., Newark, N. J.</b>		
16520	Medal Horse Feed.....	Newark .....	8.78
16521	Prize Horse Feed.....	Newark .....	13.95
16935	Company Feed .....	Paterson .....	8.80
	<b>Stamets &amp; Pursell, Phillipsburg, N. J.</b>		
16917	Pure Mixed Feed.....	Phillipsburg .....	11.57
	<b>Wilber Stires, Bridgeville, N. J.</b>		
16954	Mixed Feed .....	Bridgeville .....	10.81
	<b>W. W. Supplee, Hampton, N. J.</b>		
16908	*Corn Ears, Oats and Rye.....	Hampton .....	16.25
16911	Pure Corn, Oats and Rye Feed.....	Hampton .....	13.75
	<b>Taylor Bros., Camden, N. J.</b>		
160386	Ground Oats and Barley Feed.....	Camden .....	9.29
160387	No. 2 Dairy Feed.....	Camden .....	10.91
	<b>W. &amp; W. E. Thomas, Milford, N. J.</b>		
16986	Mixed Feed .....	Milford .....	11.40
	<b>J. A. Tiger, Califon, N. J.</b>		
16813	Horse Feed .....	Califon .....	10.74
16860	Whole Grain Feed.....	Califon .....	11.20
	<b>A. J. Van Den Berg, North Paterson, N. J.</b>		
16423	No. 1 Corn, Oats and Rye Feed.....	North Paterson ..	11.80
	<b>F. M. VanNers, Towaco, N. J.</b>		
16673	Mixed Feed .....	Towaco .....	8.49
	<b>E. J. Vusler, Hope, N. J.</b>		
16957	No. 2 Feed.....	Hope .....	11.12
	<b>A. B. Walmsley, Bernardsville, N. J.</b>		
16868	Ground Feed .....	Bernardsville .....	11.22
	<b>Wilkinson, Gaddis &amp; Co., Newark, N. J.</b>		
16624	Ideal Brand Horse Feed.....	Newark .....	10.55
	<b>W. H. Wyckoff Co., Somerville, N. J.</b>		
16625	Ideal Alfalfa Horse Feed.....	Newark .....	13.53
16621	Wil-gad-co Pure Alfalfa Horse Feed.....	Newark .....	10.69
16623	Wilco Horse Feed.....	Newark .....	9.90
	<b>G. Z. Williams, Great Meadows, N. J.</b>		
16834	No. 1 Horse Feed.....	Great Meadows ..	11.59
16833	No. 2. Horse Feed.....	Great Meadows ..	10.66
	<b>J. S. Wiseburn &amp; Son, Stephensburg, N. J.</b>		
16961	Wiseburn & Son's Special Feed.....	Stephensburg .....	12.42
	<b>Worman's Mills, Frenchtown, N. J.</b>		
160033	Mixed Feed .....	Frenchtown .....	12.09
	<b>Vernon Wortman, Pottersville, N. J.</b>		
16879	Mixed Feed .....	Pottersville .....	11.98
16882	Pure Feed .....	Pottersville .....	11.50
	<b>W. H. H. Wyckoff Co., Somerville, N. J.</b>		
16922	Wyckoff's Mixed Feed .....	Somerville .....	11.02
16927	Wyckoff's Hog Feed .....	Somerville .....	10.74
16928	Wyckoff's Ear Corn Feed .....	Somerville .....	10.52
16923	Wyckoff's Horse Feed .....	Somerville .....	7.90

\* Sample moldy.

## FEED MIXTURES (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
11.00	10.00	1.48	1.00	17.03	16.00	Corn, alfalfa meal, oats, molasses and salt.
11.50	10.00	1.90	2.00	15.08	12.00	Corn, alfalfa meal, oats, molasses and salt.
8.88	10.00	4.23	5.00	6.43	12.00	Hominy feed, cob meal and salt. Rye feed identified but not guaranteed. Ground barley and reground oat hulls guaranteed but not identified.
9.94	8.00	3.34	3.00	4.47	2.00	Corn, oats, rye and rye middlings.
11.44	8.00	3.82	2.40	3.11	20.00	Corn meal, rye feed, wheat middlings, oats and wheat bran. Hominy feed guaranteed but not identified.
7.38	8.50	2.17	3.00	5.59	5.15	Corn and cob meal, oats and rye.
9.25	9.30	3.55	4.54	1.97	3.00	Corn, oats and rye.
11.69	12.50	5.03	4.25	8.42	9.00	Oats and barley feed.
10.56	11.00	4.51	2.50	4.21	8.00	Corn bran and oat screenings. Distillers' grains, flax screenings and buckwheat middlings guaranteed but not identified. Ground grain screenings, cob meal, cracked wheat, ground corn and ground Kaffir corn identified but not guaranteed.
9.25	9.10	3.96	3.20	1.54	3.50	Corn, oats and wheat screenings.
8.81	7.00	3.43	2.00	5.95	3.50	Corn and cob meal, oats and rye.
11.13	8.00	3.68	2.00	3.84	4.50	Corn, oats and rye.
10.06	9.00	4.05	3.00	2.60	13.00	Corn, oats and rye.
10.88	10.00	5.84	4.00	4.79	8.00	Oats, corn meal, hominy feed and wheat middlings.
10.00	9.50	3.31	2.25	5.03	6.00	Rye, oats and corn.
10.00	10.30	3.47	3.30	2.99	4.50	Corn, oats and rye.
9.69	10.14	3.60	2.36	5.46	8.00	Corn and oats. Corn bran identified but not guaranteed.
8.56	10.00	1.28	2.00	11.04	12.00	Alfalfa meal, corn, rolled oats and molasses.
9.25	11.00	0.61	1.00	17.47	25.00	Alfalfa meal and molasses.
10.00	10.00	1.43	1.00	17.93	16.00	Corn, oats, alfalfa meal, molasses and salt.
9.88	8.00	3.17	3.00	2.75	7.00	Corn, oats and rye.
8.31	7.00	2.89	3.00	7.52	12.00	Corn and cob meal, oats and rye.
7.94	8.00	2.85	2.50	5.62	10.00	Rye, corn and cob meal and oats.
9.56	6.94	3.03	1.48	2.17	1.25	Rye, corn and oats.
7.73	8.00	2.87	3.00	5.87	7.00	Corn and cob meal, oats and rye.
9.44	9.00	3.67	3.00	2.67	4.00	Corn and cob meal, oats and rye.
9.56	8.00	3.88	3.00	3.18	5.00	Corn, oats and rye. Barley and wheat screenings guaranteed but not identified.
10.44	9.44	2.63	2.25	3.66	5.00	Wheat screenings, rye and corn. Oats and corn bran identified but not guaranteed.
8.81	8.00	3.04	3.00	6.66	7.50	Corn and cob meal. Oats and barley guaranteed but not identified.
15.50	13.00	4.20	3.00	8.27	12.00	Ground oats, cracked corn, wheat bran, alfalfa meal, linseed oil meal, brewers' dried grains, corn gluten feed, molasses and salt. Oat hulls identified but not guaranteed.

## POULTRY FOODS.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16634	<b>Alfocorn Milling Co., East St. Louis, Ill.</b> Alfocorn Hen Feed.....	Paterson .....	10.33
16367	<b>American Milling Co., Peoria, Ill.</b> Cluck Chuck Scratch Feed—no grit.....	Plainfield .....	11.16
16528	Tip Top Scratch Feed.....	Newark .....	11.12
160158	Sucrene Scratch Feed.....	Trenton .....	11.96
160264	Sucrene Dry Mash.....	Vineland .....	8.77
16727	<b>Blatchford Calf Meal Factory, Waukegan, Ill.</b> Blatchford's Fill the Basket Egg Mash.....	Morristown .....	8.32
16252	<b>Buffalo Cereal Co., Buffalo, N. Y.</b> Bufceco Poultry Mash .....	Woodbridge .....	9.32
16267	Bufceco Scratching Grains .....	Rahway .....	11.29
16354	Bufceco Chick Feed .....	Plainfield .....	10.80
16365	Bufceco Pigeon Feed .....	Plainfield .....	11.54
16245	Iroquois Scratching Grains .....	Perth Amboy .....	11.87
160302	Iroquois Chick Feed .....	New Brunswick .....	11.68
16432	<b>Albert Dickinson Co., Chicago, Ill.</b> Queen Poultry Mash.....	Paterson .....	9.69
16463	Queen Poultry Mash.....	Elizabeth .....	8.35
160303	Globe Egg Mash .....	New Brunswick .....	10.59
16163	Globe Chick Feed—no grit.....	Englishtown .....	10.06
16384	Globe Scratch Feed—No grit.....	Dumont .....	10.65
16464	Globe Developing Feed—no grit.....	Elizabeth .....	10.01
16248	Rival Scratch Feed—no grit.....	Woodbridge .....	10.05
16674	White Cross Scratch Feed—no grit.....	Towaco .....	11.16
16474	<b>R. D. Eaton Grain and Feed Co., Norwich, N. Y.</b> Eaton's Perfect Mash Mixture for Laying Fowls.....	West Hoboken ....	7.23
16475	Eaton's Climax Grain Mixture.....	West Hoboken ....	9.88

## POULTRY FOODS.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
10.75	10.00	3.11	3.50	1.55	4.00	Corn, wheat, Kaffir corn, sunflower seed, barley and buckwheat.
10.75	10.00	2.95	2.50	1.70	5.00	Corn, wheat, barley, Kaffir corn, sunflower seed and buckwheat.
11.50	10.00	3.43	2.50	2.16	5.00	Corn, wheat, wild buckwheat, Kaffir corn, sunflower seed and barley.
10.88	10.00	2.98	2.50	1.71	5.00	Corn, wheat, Kaffir corn, linseed oil cake, sunflower seed, buckwheat and barley.
19.00	18.00	5.75	4.50	8.37	9.00	Alfalfa meal, linseed meal, corn meal, wheat bran, corn gluten feed, meat scrap, ground grain screenings.
20.69	19.00	5.04	4.00	6.79	10.00	Locust bean meal, unpressed flaxseed, wheat flour, rice polish, barley meal, ground beans and peas, linseed oil meal, cocoa shell meal, cocoanut meal, cottonseed meal, dried milk, salt, alfalfa, bone, corn, wheat bran, wheat middlings, beef scrap, fish, capsicum, ground limestone, trace of foenugreek. <b>Anise guaranteed but not identified.</b>
17.38	15.00	5.57	4.00	5.29	6.00	Ground corn, wheat bran, wheat middlings, corn gluten feed, oat middlings and rolled oats. <b>Hominy feed guaranteed but not identified.</b>
10.19	10.00	2.97	3.00	1.60	5.00	Corn, oats, barley, buckwheat, Kaffir corn, peas, sunflower seed and wheat.
11.79	12.00	2.66	2.00	1.51	2.00	Corn, wheat, Kaffir corn, peas, millet and oat groats.
11.31	10.00	2.62	3.00	1.37	4.00	Cracked corn, wheat, peas and Kaffir corn.
10.75	10.00	2.81	3.00	1.53	5.00	Corn, barley, buckwheat, Kaffir corn, wheat, sunflower seed and small quantity of oats.
9.94	10.00	2.33	2.00	1.39	3.00	Corn, wheat, Kaffir corn, peas and millet.
11.00	11.00	4.52	2.50	6.28	10.00	Alfalfa meal, corn meal, ground corn bran, meat scrap, linseed oil cake and salt. <b>Wheat meal and wheat bran guaranteed but not identified.</b>
11.63	11.00	3.25	2.50	7.75	10.00	Same as sample No. 16432.
15.19	16.00	4.55	3.00	6.65	10.00	Alfalfa meal, corn meal, ground corn bran, linseed oil cake, meat scrap and salt. <b>Wheat bran, wheat middlings and wheat meal guaranteed but not identified.</b>
10.81	10.00	3.70	2.50	2.26	5.00	Corn, wheat, Kaffir corn, hulled oats, millet.
10.81	10.00	3.39	2.50	2.66	5.00	Corn, wheat, barley, oats, Kaffir corn, buckwheat, sunflower seed and linseed oil cake.
10.50	10.00	3.36	2.50	2.66	5.00	Corn, wheat, Kaffir corn, hulled oats, millet and buckwheat.
10.56	9.50	3.51	2.50	2.45	5.00	Corn, wheat, barley, oats, Kaffir corn, wild buckwheat and grain screenings.
10.25	10.00	3.14	2.50	2.16	5.00	Corn, wheat, barley, oats, Kaffir corn, sunflower seed and buckwheat.
17.94	17.00	4.22	4.00	7.82	8.00	Alfalfa meal, milk albumen, beef scrap, charcoal, wheat bran, Kaffir corn meal, granulated bone, whole wheat flour, linseed oil meal, corn gluten feed, pea meal, bone meal, Heneta, salt, ground oats.
10.63	11.00	3.37	2.60	3.04	3.00	Cracked yellow corn, wheat, barley, rye, Milo maize, Kaffir corn, cracked peas, buckwheat and sunflower seed.

## POULTRY FOODS—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>Edwards &amp; Loomis Co., Chicago, Ill.</b>		
160144	Red Comb Meat Mash with shell and charcoal.....	Trenton .....	9.28
16234	Red Comb Poultry Feed—no grit.....	Perth Amboy ....	10.47
16294	Red Comb Fine Chick Feed with grit and charcoal.....	Trenton .....	9.47
16295	Red Comb Coarse Chick Feed—no grit.....	Trenton .....	10.16
16236	Cackle Poultry Feed—no grit.....	Perth Amboy ....	10.18
16328	Pound Squab Pigeon Feed with grit.....	Trenton .....	10.13
	<b>Empire Grain and Elevator Co., Binghamton, N. Y.</b>		
16421	Never Fail Chick Raiser.....	Ridgewood .....	10.69
16934	Never Fail Egg Producer.....	Somerville .....	9.57
	<b>John W. Eshelman, Lancaster, Pa.</b>		
16446	Laying Mash .....	Elizabeth .....	8.15
16268	Scratch Feed—5% grit.....	Rahway .....	9.51
160135	Imperial Scratch Feed.....	Woodbridge .....	11.17
	<b>Feed Products Milling Co., Chicago, Ill.</b>		
16410	Lykit Poultry Feed—no grit.....	Ridgefield .....	10.72
16545	Eatall Scratch Feed.....	Passaic .....	10.61
	<b>Felt Bros. &amp; Gage Co., Olean, N. Y.</b>		
16542	No. 2 Mixed Chicken Feed.....	Midland Park ....	10.24
	<b>Flory Milling Co., Bangor, Pa.</b>		
16968	Golden Egg Scratch Feed.....	Vail .....	10.30
	<b>Globe Elevator Co., Buffalo, N. Y.</b>		
16037	Blue Ribbon Laying Mash .....	Red bank .....	10.10
16683	Blue Ribbon Laying Mash .....	Morristown .....	8.92
16095	Blue Ribbon Growing Mash .....	Long Branch ....	9.44
16447	Blue Ribbon Scratch Feed .....	Elizabeth .....	10.75

## POULTRY FOODS—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
14.75	15.00	4.79	4.00	6.28	8.00	Oat meal, linseed oil meal, corn meal, meat scrap, wheat bran, wheat middlings, alfalfa meal, shell and charcoal.
10.13	10.00	3.26	2.50	2.31	5.00	Wheat, cracked corn, Kaffir corn, barley, oats, sunflower seed and buckwheat.
9.25	10.00	3.32	2.50	1.79	5.00	Cracked wheat, cracked corn, cracked Kaffir corn, millet seed, hulled oats, grit and charcoal.
10.81	10.00	2.92	2.50	2.32	5.00	Wheat, cracked corn, Kaffir corn, millet seed and hulled oats.
10.88	10.00	3.02	2.50	1.82	5.00	Wheat, cracked corn, Kaffir corn, barley, oats and sunflower seed.
11.63	10.00	3.27	2.50	2.71	5.00	Cracked corn, wheat, Kaffir corn, peas, millet, hemp, buckwheat and grit. Small amount of oats and barley present but not guaranteed.
10.50	11.00	2.55	2.50	1.90	3.00	Millet, wheat, corn, Kaffir corn and oats. Barley and milo-maize guaranteed but not identified.
10.38	8.75	4.46	3.75	2.90	4.25	Wheat, corn, barley, oats, Kaffir corn, buckwheat and Milo maize.
21.13	20.00	6.19	5.00	7.08	6.00	Beef scrap, fish scrap, corn gluten feed, cottonseed meal, linseed oil cake meal, alfalfa meal, wheat bran, wheat middlings, corn meal, ground grain screenings and oats.
10.13	10.00	2.68	3.00	1.59	3.00	Cracked corn, wheat, barley, Kaffir corn, buckwheat, rye, oats and grit. Grain screenings from wheat and sunflower seed guaranteed but not identified.
10.81	10.00	3.26	3.00	1.92	3.00	Milo maize, wheat, cracked corn, barley, buckwheat, Kaffir corn and grain screenings from wheat. Rye guaranteed but not identified and small amount of oats found but not guaranteed.
10.69	10.00	3.50	2.50	2.44	5.00	Wheat, cracked corn, Kaffir corn, oats, barley and sunflower seed. Wild buckwheat guaranteed but not identified.
10.44	10.00	2.92	2.50	2.57	5.00	Wheat, Kaffir corn, cracked corn, barley, buckwheat, sunflower seed. Charcoal guaranteed but not identified.
10.50	10.50	3.32	2.50	2.16	4.00	Wheat, Kaffir corn, cracked corn, buckwheat and barley. Rye identified but not guaranteed.
11.06	10.00	3.18	4.00	2.41	3.00	Barley, oats, cracked corn, Kaffir corn, buckwheat and wheat. Sunflower seed guaranteed but not identified.
18.81	20.00	4.68	3.00	8.80	10.00	Wheat bran, wheat middlings, wheat flour, ground oats, corn meal, corn gluten feed, pea meal, alfalfa meal, linseed oil meal, meat meal and ground bone. Fish scrap guaranteed but not identified.
20.13	20.00	5.78	3.00	7.88	10.00	Wheat bran, wheat middlings, wheat flour, ground oats, corn meal, corn gluten feed, pea meal, alfalfa meal, fish scrap, linseed oil meal, meat meal and ground bone.
16.00	15.00	3.52	4.00	6.02	7.00	Wheat bran, corn gluten feed, corn meal and oat meal.
10.75	12.00	3.26	4.00	2.52	4.00	Cracked corn, wheat, barley, Kaffir corn, oats, buckwheat, sunflower seed and split peas.

## POULTRY FOODS—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>Globe Elevator Co., Buffalo, N. Y.—Continued.</b>		
16138	Blue Ribbon Developing Feed .....	Freehold .....	11.51
16583	Blue Ribbon Pigeon Feed.....	Paterson .....	10.22
16843	Anchor Brand Scratch Feed.....	Hackettstown ....	10.64
	<b>Howard H. Hanks Co., Chicago, Ill.</b>		
160338	Golden Egg Scratch Feed with grit.....	Mt. Holly .....	10.35
	<b>Jamestown Electric Mills, Jamestown, N. Y.</b>		
16179	Electric Hen Feed.....	Milltown .....	11.40
	<b>Chas. A. Krause Milling Co., Milwaukee, Wis.</b>		
16750	Blue Top Scratch Feed—no grit.....	Branchville .....	10.80
	<b>Miner-Hillard Milling Co., Wilkesbarre, Pa.</b>		
16671	Little Chick Feed.....	Hamburg .....	11.60
	<b>Nowak Milling Corporation, Buffalo, N. Y.</b>		
16039	Lay-egg-o Dry Mash.....	Red Bank .....	7.62
160307	Lay-egg-o Dry Mash.....	New Brunswick ...	8.33
16099	Marathon Scratch Feed.....	Manasquan .....	11.72
16227	Marathon Scratch Feed.....	Perth Amboy ....	9.67
160077	Fidelity Scratch Feed.....	Pennington .....	11.15
16288	Justice Scratch Feed.....	Hopewell .....	10.32
160152	Justice Pigeon Feed.....	Trenton .....	10.56
	<b>Oswego Milling Co., Oswego, N. Y.</b>		
16413	Pontiac Scratch Feed.....	Ridgewood .....	10.85
	<b>Park &amp; Pollard Co., Boston, Mass.</b>		
16324	Lay or Bust (Dry Mash).....	Trenton .....	8.34
16468	Growing Feed .....	Elizabeth .....	8.82
16386	Screened Scratch Feed.....	Dumont .....	10.10
16130	Margaret Mahaney's Turkey Feed.....	Moorestown .....	9.17

## POULTRY FOODS—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
10.63	11.00	2.24	2.00	1.70	4.00	Cracked corn, Kaffir corn, wheat, buckwheat, cracked green peas. Millet seed guaranteed but not identified.
11.00	12.00	3.19	4.00	2.19	4.00	Wheat, Kaffir corn, cracked corn, buckwheat, hemp, peas and millet.
10.13	12.00	3.26	4.00	2.74	5.00	Buckwheat, cracked corn, Kaffir corn, wheat, barley, oats and cracked peas.
9.98	10.00	3.07	2.50	2.27	5.00	Wheat, cracked corn, oats, Kaffir corn, barley, sunflower seed, buckwheat, grit and oyster shell. Charcoal guaranteed but not identified.
10.50	10.00	4.07	3.00	1.92	5.00	Cracked corn, wheat, Kaffir corn and oats. Buckwheat and sunflower seed guaranteed but not identified. Barley identified but not guaranteed.
9.94	10.00	3.02	2.50	2.42	5.00	Corn, wheat, buckwheat, barley, oats, Kaffir corn and sunflower seed.
9.25	8.00	2.57	2.00	1.71	4.00	Cracked wheat, cracked corn, cracked Kaffir corn, millet and cracked peas.
13.00	12.00	2.37	3.00	5.03	4.00	Corn feed meal, corn gluten feed, wheat bran, wheat middlings and Henota.
11.19	12.00	2.01	3.00	4.24	4.00	Same as sample No. 16039.
9.88	10.00	3.28	3.00	2.53	5.00	Wheat, milo-maize, whole and cracked corn, barley. Recleaned grain screenings and buckwheat guaranteed but not identified.
9.94	10.00	3.70	3.00	2.61	5.00	Wheat, milo-maize, cracked corn, barley, and grain screenings from wheat. Buckwheat guaranteed but not identified. Small amount of oats present but not guaranteed.
10.13	10.00	2.95	3.00	2.38	5.00	Cracked corn, wheat, milo-maize, barley, buckwheat and sunflower seed. Oats identified but not guaranteed.
10.25	10.00	3.34	3.00	3.06	5.00	Cracked corn, whole wheat, milo-maize, whole barley, buckwheat, split peas, sunflower seed. Small amount of oats present but not guaranteed.
11.31	10.00	3.64	3.00	2.33	5.00	Cracked corn, wheat, milo-maize and peas. Hemp and small amount of oats identified but not guaranteed.
11.19	10.00	2.77	1.50	2.33	5.00	Cracked corn, wheat, barley, buckwheat, oats, Kaffir corn and milo-maize. Damaged wheat present.
18.25	18.00	3.58	3.50	6.80	12.00	Wheat bran, wheat middlings, corn, wheat, buckwheat, alfalfa meal, oats, barley, Kaffir corn, fish, meat, bone, beet pulp, calcium carbonate, salt.
14.19	10.00	4.41	3.50	3.79	8.00	Ground corn, wheat, barley, oats, meat, bone, alfalfa meal, Kaffir corn, wheat bran, wheat middlings, buckwheat, beet pulp, calcium carbonate and salt. Small amount of cottonseed meal identified but not guaranteed.
9.35	10.00	3.25	3.50	2.02	5.00	Cracked corn, wheat, barley, oats, Kaffir corn and sunflower seed. Buckwheat guaranteed but not identified.
14.50	10.00	4.00	3.50	5.89	12.00	Ground wheat, barley, linseed oil meal, oats, meat, bone, calcium hydroxide, calcium carbonate and salt.

## POULTRY FOODS—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>Park &amp; Pollard Co., Boston, Mass.—Continued.</b>		
16322	Intermediate Chick Feed.....	Trenton .....	11.54
160387	Red Ribbon Scratch Feed.....	Dumont .....	9.71
16416	Pigeon Feed .....	Ridgewood .....	10.23
16591	Gritless Chick Feed.....	Newark .....	9.27
160270	Pontiac Scratch Feed.....	Vineland .....	11.15
160140	Red Ribbon Chick Feed.....	Trenton .....	10.04
	<b>Phelps &amp; Sibley Co., Cuba, N. Y.</b>		
16420	Favorite Poultry Mash.....	Ridgewood .....	7.93
16378	Favorite Mixed Grains.....	Homestead .....	10.49
16587	Phelps & Sibley Co.'s Scratch Grains.....	Paterson .....	10.70
	<b>Philadelphia Seed Co., Philadelphia, Pa.</b>		
160186	Purgrain Scratch Poultry Feed No. 1.....	Elmer .....	10.83
	<b>Quaker Oats Co., Chicago, Ill.</b>		
16426	American Poultry Feed.....	Paterson .....	8.95
16273	Quaker Scratch Grains.....	Hopewell .....	10.16
160274	Schumacher Scratch Grains.....	Vineland .....	10.22
	<b>Ralston-Purina Co., St. Louis, Mo.</b>		
16512	Winner Scratch Feed.....	Jersey City .....	10.23
16174	Protena Scratch Feed.....	Jamesburg .....	9.03
16214	Purina Scratch Feed.....	Mt. Holly .....	9.37
16057	Purina Special Scratch Feed.....	Red Bank .....	11.05
160241	Purina Chick Feed.....	Bridgeton .....	9.60
	<b>S. F. Scattergood &amp; Co., Philadelphia, Pa.</b>		
16743	Scattergood Scratch Feed.....	Lafayette .....	9.57
	<b>Simpson, Hendee &amp; Co., New York City.</b>		
16352	Shaw & Truesdell's Chick Food.....	Oradell .....	8.97
	<b>The Sugarine Co., Peoria, Ill.</b>		
160150	Sugarine Scratch Feed.....	Trenton .....	10.95
160217	Universal Scratch Feed.....	Allentown .....	10.89

## POULTRY FOODS—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
9.88	10.00	2.95	3.50	2.21	5.00	Cracked corn, wheat, buckwheat, oats, millet, Kaffir corn and milo-maize.
11.00	10.00	4.15	3.50	3.41	5.00	Cracked corn, wheat, buckwheat, barley, oats, Kaffir corn, milo-maize and sunflower seed.
10.88	10.00	3.41	1.00	3.00	10.00	Cracked corn, wheat, buckwheat, peas, Kaffir corn and milo-maize.
14.00	11.00	3.35	3.50	2.32	5.00	Cracked corn, wheat, Kaffir corn, milo-maize, millet seed, oat groats and shredded fish.
10.88	10.00	3.37	1.50	2.45	5.00	Cracked corn, wheat, barley, buckwheat, oats, Kaffir corn and milo-maize. <b>Damaged wheat present.</b>
10.13	10.00	3.63	3.50	2.45	5.00	Cracked corn, wheat, oat groats, Kaffir corn, milo-maize and millet seed.
21.44	17.00	4.57	3.00	8.48	9.00	Linseed oil meal, beef scrap, alfalfa meal, corn gluten feed, ground oats, wheat middlings, corn meal, wheat bran, charcoal and salt.
10.88	10.00	3.78	2.50	1.87	5.00	Cracked corn, buckwheat, wheat, Kaffir corn and sunflower seed. <b>Small amount of oats identified but not guaranteed.</b>
10.44	8.00	2.88	2.00	1.80	5.00	Cracked corn, Kaffir corn, milo-maize, buckwheat, oats, wheat and wheat screenings.
11.25	10.00	3.10	3.00	3.02	5.00	Cracked corn, wheat, Kaffir corn, barley, oats, buckwheat and sunflower seeds. <b>Peas identified but not guaranteed.</b>
12.31	12.00	4.73	3.50	4.26	8.00	Hominy feed, cottonseed meal, wheat bran and wheat middlings. <b>Ground barley and rye shorts guaranteed but not identified. Ground corn and corn bran identified but not guaranteed.</b>
10.50	10.00	3.29	2.50	2.12	5.00	Whole wheat, Kaffir corn, barley, cracked corn, buckwheat and sunflower seed. <b>Oats identified but not guaranteed.</b>
11.00	10.00	3.52	2.50	2.30	5.00	Whole wheat, Kaffir corn, barley, buckwheat, cracked corn and sunflower seed. <b>Small amount of oats identified but not guaranteed.</b>
9.81	10.00	3.36	3.00	2.37	4.00	Wheat, corn, barley, sunflower seed, Kaffir corn, milo-maize and wheat screenings.
10.00	10.00	3.86	3.00	2.33	6.00	Wheat, corn, barley, sunflower seed, Kaffir corn.
10.38	11.00	3.40	3.00	2.80	4.00	Wheat, corn, barley, Kaffir corn and sunflower seed.
10.13	11.00	3.50	3.00	2.85	4.00	Wheat, corn, barley, Kaffir corn, buckwheat and sunflower seed.
10.06	11.00	2.69	3.00	2.44	4.00	Wheat, corn, millet, Kaffir corn and milo-maize.
10.63	10.00	3.33	3.25	2.40	5.00	Cracked corn, wheat, hulled oats, Kaffir corn, barley and sunflower seed.
11.31	10.00	3.45	3.00	2.27	3.00	Cracked corn, cracked wheat, and rice. <b>Millet and pin head oat meal guaranteed but not identified. Oats and 8% weed seed identified but not guaranteed.</b>
9.81	10.00	2.93	2.50	2.15	5.00	Corn, wheat, Kaffir corn, linseed oil cake, sunflower seed, buckwheat and barley.
10.38	10.00	2.69	2.50	1.99	5.00	Corn, wheat, barley, Kaffir corn, sunflower seed and buckwheat.

## POULTRY FOODS—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16708	Tioga Mill and Elevator Co., Waverly, N. Y. Derby Scratch Feed.....	Sussex .....	10.31
16836	Ti-O-Ga Poultry Grains.....	Great Meadows ...	10.70
16424	L. R. Wallace, Middletown, N. Y. Mapes Balanced Ration for Poultry.....	North Paterson ...	9.21
160381	William T. Will, Jr., Philadelphia, Pa. Ideal Scratch Feed.....	Hammonton .....	10.43
16788	Frank C. Williams, Easton, Pa. Williams Diamond Chick Feed.....	Dover .....	9.79
16932	Williams Diamond Scratch Feed.....	Somerville .....	11.24
160380	Wood, Stubbs & Co., Louisville, Ky. Shawnee Brand Pigeon Feed.....	Hammonton .....	10.92

## POULTRY FOODS (NEW JERSEY MANUFACTURERS).

160294	H. R. Applegate, Hightstown, N. J. Jersey Dry Mash.....	Hightstown .....	9.32
16155	The Asbury Co., Spotswood, N. J. Asbury Scratch Feed.....	Spotswood .....	11.13
16225	A. K. Ashby, Burlington, N. J. Scratch Food .....	Burlington .....	10.88
16647	Frank Atherton Grain Co., Paterson, N. J. Mixed Hen Feed.....	Paterson .....	11.10
16648	Poultry Laying Mash.....	Paterson .....	9.16
16850	Warren Beaty, Hackettstown, N. J. Beaty's Mash Feed.....	Hackettstown .....	10.74
16849	Beaty's Scratch Feed.....	Hackettstown .....	10.87
160316	B. M. Beideman, Merchantville, N. J. Beideman Mash Food.....	Merchantville .....	11.15
160314	Beideman Scratch Feed.....	Merchantville .....	12.27
16469	G. B. Benedict, Elizabeth, N. J. Mixed Chicken Feed.....	Elizabeth .....	11.32
160110	Frank Bird, Flemington, N. J. Cereal Laying Feed.....	Flemington .....	9.64
16597	F. R. Blamey, Bloomfield, N. J. Chicken Mash .....	Bloomfield .....	8.27
16604	Blamey's Mixed Grains.....	Bloomfield .....	11.01

## POULTRY FOODS—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
10.69	10.00	3.25	2.04	2.88	5.50	Cracked corn, wheat, buckwheat, Kaffir corn, oats, barley and sunflower seed.
10.38	10.70	3.16	2.08	2.39	4.79	Cracked corn, wheat, buckwheat, Kaffir corn, oats, barley and sunflower seed.
14.63	12.00	4.24	4.00	6.53	8.00	Meat scrap, ground bone, corn meal, wheat middlings, wheat bran, corn gluten feed, ground oats and alfalfa meal.
10.94	8.00	3.95	2.00	3.46	4.00	Wheat, cracked corn, barley, Kaffir corn, sunflower seed and buckwheat. Charcoal and wheat screenings guaranteed but not identified.
10.19	10.31	2.67	3.64	2.95	5.06	Wheat, corn, Kaffir corn, oat groats, grit, charcoal and millet.
10.50	9.00	2.71	2.00	1.96	3.40	Wheat, corn, barley, buckwheat, charcoal, Kaffir corn and sunflower seed.
11.00	15.75	3.01	2.85	1.64	4.10	Kaffir corn, corn, wheat, buckwheat, milo-maize, peas and sunflower seed. Hemp and millet guaranteed but not identified.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS).

19.38	20.00	5.06	4.50	12.63	10.00	Wheat bran, wheat middlings, corn meal, corn gluten feed, alfalfa meal, meat scrap, ground oats and charcoal.
10.56	10.00	3.86	3.50	2.71	4.50	Sunflower seed, buckwheat, Kaffir corn, barley, oats, wheat and cracked corn.
10.31	.....	3.32	.....	2.64	.....	Wheat, cracked corn, oats, buckwheat, Kaffir corn and charcoal.
10.38	12.00	3.34	3.00	1.86	5.00	Corn, wheat, barley, Kaffir corn, buckwheat and sunflower seed.
13.44	9.00	5.11	3.00	7.37	7.00	Corn meal, wheat bran and wheat middlings.
13.00	10.00	4.39	3.00	4.65	10.00	Corn meal, alfalfa meal, buckwheat middlings, wheat bran and oats.
9.44	7.00	3.29	3.00	3.33	5.00	Cracked corn, wheat, oats, buckwheat and Kaffir corn.
12.13	12.00	3.66	3.50	7.50	6.00	Corn meal, ground oats, wheat middlings, wheat bran, alfalfa meal and salt.
8.75	10.00	3.37	3.00	2.26	2.50	Cracked corn, wheat, buckwheat, Kaffir corn and sunflower seed.
10.44	9.94	2.99	3.50	1.89	2.25	Corn, wheat, cracked corn, barley, buckwheat, Kaffir corn and oats.
17.38	16.00	6.31	5.00	5.40	8.00	Wheat bran, ground oats, corn meal, buckwheat middlings, buckwheat hulls, beef scrap, millet and millet hulls.
18.44	14.20	4.85	5.00	8.57	10.00	Wheat middlings, wheat bran, linseed oil meal, alfalfa meal, ground oats and beef scrap.
10.31	9.00	3.21	2.50	1.87	4.00	Cracked corn, Kaffir corn, wheat, buckwheat and barley. Sunflower seed guaranteed but not identified.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16405	H. H. Blauvelt, Ridgewood, N. J. Poultry Feed (Dry Mash).....	Ridgewood .....	9.66
16408	Scratch Feed .....	Ridgewood .....	12.30
160359	Geo. Boggs & Son, West Collingswood, N. J. Excelsior Dry Mash Feed.....	W. Collingswood ..	9.76
160358	Excelsior Scratching Feed.....	W. Collingswood ..	11.37
16548	Campbell, Morrell & Co., Passaic, N. J. Eureka Scratch Feed .....	Passaic .....	10.90
16549	Eureka Pigeon Feed .....	Passaic .....	10.97
16550	Eureka Poultry Mash .....	Passaic .....	8.91
16515	Carscalien & Cassidy, Jersey City, N. J. Scratch Feed .....	Jersey City .....	10.93
16120	J. S. Collins & Son, Inc., Moorestown, N. J. Rice's Mixture .....	Moorestown .....	9.03
16121	Pigeon Feed .....	Moorestown .....	10.69
16118	Scratch Feed .....	Moorestown .....	11.24
16357	Commercial Mill and Elevator, Plainfield, N. J. C. M. & E. Mixed Grains.....	Plainfield .....	11.46
16818	J. M. Conover & Son, Bartley, N. J. Conover's Scratch Feed.....	Bartley .....	12.05
16370	Consumers Coal Co., Plainfield, N. J. Star Mixture .....	Plainfield .....	9.90
16371	Mixed Grains .....	Plainfield .....	10.11
16476	Geo. Cox & Sons, West Hoboken, N. J. Cox's Mixed Grains.....	West Hoboken ....	10.79
16455	A. D. Crane, Elizabeth, N. J. Affect Mixture .....	Roselle Park .....	10.65
16460	Soft Mash .....	Roselle Park .....	10.22
16456	Crane's Mixed Grains.....	Roselle Park .....	10.88
16457	Crane's Mixed Grains—no shell or grit.....	Roselle Park .....	11.62

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
23.00	23.91	5.70	9.50	5.65	1.50	Wheat bran, wheat middlings, corn meal, corn gluten feed, linseed oil meal, beef scrap, alfalfa meal and crushed oats.
10.69	10.69	3.52	3.52	2.17	2.17	Cracked corn, wheat, oats, Kaffir corn, buckwheat, sunflower seed and barley.
13.81	13.34	4.09	4.04	8.10	8.25	Wheat bran, corn meal, corn gluten feed, wheat middlings, alfalfa meal. <b>Ground oats guaranteed but not identified.</b>
9.50	8.50	3.11	4.17	1.89	3.75	Cracked corn, wheat, buckwheat, barley, oats, sunflower seed and Kaffir corn.
10.13	10.00	2.97	3.12	2.00	2.36	Cracked corn, buckwheat, wheat, Kaffir corn, sunflower seed and barley.
10.56	12.00	3.74	5.00	1.67	2.88	Wheat, buckwheat, cracked corn, hemp seed, Kaffir corn and peas. <b>Millet guaranteed but not identified.</b>
19.44	12.00	5.06	3.00	6.65	6.01	Wheat middlings, wheat bran, ground oats, alfalfa meal, corn meal, beef scrap and corn gluten feed. <b>Oil meal guaranteed but not identified. Cottonseed meal identified but not guaranteed.</b>
10.31	9.00	4.22	3.00	2.91	6.00	Cracked corn, buckwheat, Kaffir corn, milo-maize, sunflower seed, oats, wheat, barley and shell.
17.63	18.00	4.53	5.00	5.14	5.00	Wheat bran, corn meal, wheat middlings, linseed oil meal and ground meat. <b>Ground oats guaranteed but not identified. Corn gluten feed and Heneta identified but not guaranteed.</b>
12.56	12.00	4.11	4.00	2.91	4.00	Cracked corn, wheat, peas, hemp, millet and Kaffir corn.
11.00	12.60	3.34	4.00	2.37	4.00	Cracked corn, Kaffir corn, wheat, barley and buckwheat.
9.63	11.00	3.15	3.00	1.95	4.00	Corn, wheat, oats, cracked corn, buckwheat and sunflower seed.
10.31	9.50	3.32	3.00	2.88	2.50	Cracked corn, wheat, buckwheat, barley, oats, Kaffir corn and sunflower seed.
16.00	18.63	4.33	5.87	7.25	6.90	Corn meal, wheat bran, corn gluten feed, wheat middlings, ground oats, beef scrap, linseed oil meal and alfalfa meal.
10.38	8.69	3.93	2.33	2.65	2.30	Cracked corn, wheat, corn, Kaffir corn, oats, shell and barley. <b>Buckwheat, rye and wheat screenings identified but not guaranteed.</b>
9.75	11.00	3.29	2.60	1.60	3.00	Cracked corn, whole wheat, buckwheat, corn, Kaffir corn, sunflower seed, oats and Heneta.
13.63	12.00	4.45	3.00	4.04	7.00	Wheat bran, wheat middlings, ground oats, corn meal, beef scrap and ground flaxseed.
12.06	10.00	3.78	2.00	3.24	7.00	Corn meal, wheat middlings and wheat bran. <b>Oats identified but not guaranteed.</b>
10.38	8.00	3.15	3.00	2.47	5.00	Shell, grit, corn, cracked corn, wheat, buckwheat, barley, Kaffir corn and sunflower seed. <b>Oats guaranteed but not identified.</b>
10.63	8.00	3.60	3.00	2.52	5.00	Corn, cracked corn, wheat, buckwheat, barley, oats, Kaffir corn and sunflower seed. <b>Contained damaged wheat.</b>

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>A. D. Crane, Elizabeth, N. J.—Continued.</b>		
16458	Crane's Fine Mixed Grains—no shell or grit.....	Roselle Park .....	11.74
16459	Crane's Fine Mixed Grains .....	Roselle Park .....	11.06
	<b>W. A. Crowell, Metuchen, N. J.</b>		
16253	Scratching Rations .....	Metuchen .....	11.33
16255	Dry Mash .....	Metuchen .....	7.89
	<b>A. Cyphers Co., Newark, N. J.</b>		
16479	Cypho Morning Mash—A grade.....	Newark .....	8.84
16570	Cypho Morning Mash—A grade.....	Signae .....	7.83
16478	Cypho Morning Mash—B grade.....	Newark .....	8.83
16579	Cypho Morning Mash—B grade.....	Little Falls .....	8.51
16477	Cypho Scratching Food—A grade.....	Newark .....	11.20
16480	Cypho Chick Developer .....	Newark .....	9.76
16263	Cypho Chick Developer .....	New Brunswick ..	10.54
16182	Cypho Mixed Grains for Poultry.....	South River .....	10.56
16241	Cypho Scratching Food .....	Perth Amboy .....	11.29
16412	Cypho Scratching Grains—B grade.....	Ridgewood .....	9.96
16482	Cypho Chick Food—A grade.....	Newark .....	9.81
16481	Cypho Chick Food—B grade.....	Newark .....	8.86
16486	Cypho Mixed Grains .....	Newark .....	10.24
16487	Cypho Pigeon Scratch Food .....	Newark .....	9.35
16488	Burt Bros. Scratch Special.....	Newark .....	10.50
16489	Lustro Scratching Grains.....	Newark .....	10.49
16497	Martenis Chicken Feed.....	Jersey City .....	10.95
16498	Martenis Scratching Food.....	Jersey City .....	10.51

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
11.13	8.00	3.04	3.00	1.91	5.00	Cracked corn, wheat, buckwheat, barley, Kaffir corn and sunflower seed. Oats guaranteed but not identified.
10.06	8.00	2.59	3.00	1.80	5.00	Cracked corn, wheat, buckwheat, barley, Kaffir corn, sunflower seed, shell and grit. Oats guaranteed but not identified.
9.94	10.00	3.33	3.00	3.19	5.00	Cracked corn, wheat, oats and buckwheat.
17.13	16.00	6.14	4.00	8.77	10.00	Wheat middlings, corn meal, corn gluten feed, ground oats, alfalfa meal and beef scrap. Cottonseed meal and corn bran identified but not guaranteed.
17.81	15.00	4.80	3.00	9.01	12.00	Corn meal, ground Kaffir corn, wheat middlings, alfalfa meal, rolled oats; cottonseed meal, linseed oil meal, corn gluten feed, buckwheat middlings, buckwheat hulls, ground charcoal, meat and bone meal. Ground peas identified but not guaranteed.
17.19	15.00	4.49	3.00	10.39	12.00	Same as sample No. 16479.
15.56	15.00	4.12	3.00	9.83	12.00	Corn meal, ground Kaffir corn, wheat middlings, alfalfa meal, rolled oats, cottonseed meal, linseed oil meal, buckwheat middlings, buckwheat hulls, ground charcoal and corn gluten feed. Ground peas identified but not guaranteed.
16.88	15.00	4.15	3.00	10.09	12.00	Same as sample No. 16478.
10.63	10.00	3.03	2.50	1.58	3.00	Cracked corn, wheat, buckwheat, Kaffir corn, barley, sunflower seed and green peas.
12.13	10.00	3.39	3.00	1.50	3.00	Wheat, Kaffir corn, broken rice, cracked corn, oat groats, cracked green peas and granulated bone.
10.69	10.00	2.93	3.00	1.36	3.00	Same as sample No. 16480.
10.06	10.00	3.35	2.00	1.93	3.00	Cracked corn, wheat, buckwheat, Kaffir corn and barley. Damaged wheat identified. Sunflower seed guaranteed but not identified.
10.25	10.00	3.28	2.50	1.57	3.00	Cracked corn, wheat, buckwheat, Kaffir corn, barley, sunflower seed and green peas.
10.25	10.00	2.95	3.00	1.83	3.00	Cracked corn, wheat, buckwheat, Kaffir corn, barley, wheat screenings, grit, oyster shells. Damaged wheat identified.
11.38	10.00	4.20	2.00	1.94	3.00	Cracked corn, cracked Kaffir corn, oat groats, cracked wheat, broken rice, millet seed and cracked green peas.
9.69	10.00	3.38	2.00	1.90	3.00	Cracked corn, cracked Kaffir corn, cracked wheat, ground wheat screenings, oat groats, broken rice, millet seed, grit and shell. Damaged wheat identified.
10.00	10.00	3.12	2.00	1.78	3.00	Cracked corn, wheat, buckwheat, Kaffir corn, barley and sunflower seed. Damaged wheat identified.
12.00	10.00	5.28	4.00	3.51	3.00	Cracked corn, Kaffir corn, wheat, peas, hemp seed and grit.
10.63	10.00	2.88	2.00	1.58	3.00	Cracked corn, wheat, buckwheat, Kaffir corn, barley and sunflower seed. Peas identified but not guaranteed.
10.44	10.00	2.85	2.00	1.61	3.00	Cracked corn, wheat, buckwheat, Kaffir corn and barley. Sunflower seed guaranteed but not identified. Damaged wheat identified.
10.38	10.00	3.10	2.00	2.12	3.00	Cracked corn, wheat, Kaffir corn, barley, buckwheat, sunflower seed and whole corn.
10.63	10.00	2.57	2.00	2.48	3.00	Cracked corn, wheat, Kaffir corn, barley, buckwheat and sunflower seed.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16305	J. S. Darnell, Trenton, N. J. Excelsior Poultry Mash.....	Trenton .....	9.15
16306	The World's Best Scratching Feed.....	Trenton .....	11.09
16713	Decker & Simmons, Sussex, N. J. D. & S. Laying Feed.....	Sussex .....	9.49
16041	N. Drake, Newark, N. J. Scratch Feed .....	Newark .....	10.66
160251	Eldredge & Phillips, Cape May City, N. J. Special Poultry Mash.....	Cape May City....	8.71
160252	Special Scratch Food.....	Cape May City....	10.29
16215	Fennimore Bros., Mt. Holly, N. J. Dry Mash .....	Mt. Holly .....	9.65
16216	Scratch Feed .....	Mt. Holly .....	11.22
16381	H. S. Ferdon, Leonia, N. J. Ferdon Scratch Feed.....	Leonia .....	10.80
16839	G. W. Fisher, Port Murray, N. J. Fisher's Scratch Feed.....	Port Murray ....	11.73
16391	B. Flecke, Englewood, N. J. Mash .....	Englewood .....	10.63
16393	Scratch Feed .....	Englewood .....	10.59
160355	B. F. Fowler & Co., Haddonfield, N. J. Peerless Hen Food.....	Haddonfield .....	10.12
16786	James Gardner, Dover, N. J. Star Scratch Grains.....	Dover .....	11.45
160300	Gross Bros., Hightstown, N. J. Scratch Food Cereal Egg Producer.....	Hightstown .....	11.32
160301	Poultry Dry Mash.....	Hightstown .....	9.19
16276	J. H. Grover & Son, Princeton Junction, N. J. Henola Mash Food—Formula BB.....	Princeton Junction.	7.69
16337	Hackensack Grain and Hay Co., Hackensack, N. J. Laying Mash .....	Hackensack .....	9.03
16338	Hackensack Scratch Feed.....	Hackensack .....	10.96
16339	Henola Dry Mash.....	Hackensack .....	9.12

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
18.69	16.07	5.76	4.00	7.75	10.00	Wheat bran, wheat middlings, corn meal, beef scrap, ground oats, alfalfa meal and charcoal.
10.56	10.00	3.55	3.00	2.52	4.00	Wheat, cracked corn, barley, Kaffir corn, buckwheat, oats and sunflower seed.
20.25	18.00	5.56	4.50	4.34	5.00	Corn meal, wheat bran, wheat middlings and beef scrap.
10.13	10.00	4.09	3.50	2.16	5.00	Wheat, cracked corn, barley, oats, Kaffir corn, buckwheat and sunflower seed.
20.19	18.00	5.29	6.00	9.17	9.00	Wheat bran, corn meal, oats, corn gluten feed, wheat middlings, cottonseed meal, meat scrap, alfalfa meal, charcoal and salt.
11.06	11.00	5.58	4.75	4.03	3.25	Corn, barley, Kaffir corn, wheat, oats, millet, buckwheat, hemp and sunflower seed.
14.88	14.00	4.46	3.00	6.15	.....	Corn meal, wheat bran, wheat middlings, alfalfa meal, crushed oats, corn gluten feed and salt. Cottonseed meal identified but not guaranteed.
10.44	.....	3.50	.....	2.96	.....	Cracked corn, wheat, oats, barley, buckwheat, Kaffir corn and charcoal.
10.88	10.46	3.80	3.46	2.51	3.87	Cracked corn, wheat, Kaffir corn, buckwheat, oats and sunflower seed.
9.94	9.00	3.12	3.00	1.89	5.00	Buckwheat, cracked corn, Kaffir corn, wheat, oats and sunflower seed.
11.50	10.00	3.86	2.50	4.43	10.00	Corn, oats, alfalfa meal, wheat bran and wheat middlings. Gluten meal guaranteed but not identified. Corn bran identified but not guaranteed.
10.81	10.00	3.08	3.00	2.09	5.00	Cracked corn, wheat, buckwheat, Kaffir corn and sunflower seed. Damaged wheat identified.
11.88	10.06	4.32	3.48	3.33	3.19	Corn, cracked corn, wheat, oats, buckwheat, Kaffir corn, millet, charcoal and ground meat.
9.88	9.00	3.14	3.00	1.64	10.00	Cracked corn, wheat, buckwheat, Kaffir corn and oats.
9.94	12.00	3.47	3.48	2.82	3.96	Cracked corn, wheat, barley, Kaffir corn, oats, peas, sunflower seed and buckwheat.
16.63	16.56	4.98	4.20	9.86	10.45	Wheat bran, wheat middlings, corn meal, alfalfa meal, beef scrap, charcoal, linseed oil meal, salt and cottonseed meal. Ground oats guaranteed but not identified. Corn gluten feed identified but not guaranteed.
10.63	12.00	3.31	3.00	4.12	4.00	Corn meal, corn gluten feed, wheat middlings, wheat bran and Heneta. Linseed oil meal guaranteed but not identified.
16.38	13.32	4.93	4.20	7.89	9.49	Wheat bran, corn meal, wheat middlings, ground oats, linseed oil meal, meat scrap and alfalfa meal.
10.69	10.50	3.29	3.10	2.04	3.90	Wheat, cracked corn, barley, buckwheat and Kaffir corn.
12.06	10.00	3.20	2.50	3.96	4.00	Corn meal, wheat middlings, wheat bran, linseed oil meal and Heneta.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16661	Reeve Harden, Hamburg, N. J. Scratching Grains .....	Hamburg .....	9.45
16359	Jos. Harrigan, Plainfield, N. J. Harrigan's Poultry Mash.....	Plainfield .....	9.45
16375	Harrigan's Mixed Grains.....	Plainfield .....	11.42
16618	Harrison Co., Caldwell, N. J. Red Dragon Scratch Feed.....	Caldwell .....	10.76
16613	Harrison Milling Co., Montclair, N. J. Chicken Mash .....	Montclair .....	9.32
16614	Star Scratch Feed.....	Montclair .....	10.98
16448	The Hildebrant Co., Elizabeth, N. J. Mixed Grains .....	Elizabeth .....	11.05
16334	Holley & Smith, Hackensack, N. J. Dry Mash .....	Hackensack .....	9.22
16336	Mixed Grains .....	Hackensack .....	11.26
16111	E. Hollingshead, Moorestown, N. J. Rice's Mixture .....	Moorestown .....	9.49
16112	Our Own Scratch Food.....	Moorestown .....	10.37
16113	Our Own Chick Feed.....	Moorestown .....	9.91
160210	Hutchinson Bros., Crosswicks, N. J. H. B. Poultry Mash.....	Crosswicks .....	9.06
160206	H. B. Scratch Feed.....	Crosswicks .....	10.26
16317	E. C. Hutchinson Milling Co., Trenton, N. J. Hamilton Scratch Feed.....	Trenton .....	10.86
16978	W. I. Jacoby, Finesville, N. J. Mixed Grains .....	Finesville .....	11.62
16392	Edward G. Kaufer, Fort Lee, N. J. Harmony Scratching Feed.....	Fort Lee .....	10.44
16679	C. L. Lade, Morristown, N. J. Lade's Poultry Mash.....	Morristown .....	9.12
160348	M. E. Lamb, New Egypt, N. J. Buckeye Scratch Feed.....	New Egypt .....	10.92
16919	J. C. Larison, Washington, N. J. Larison's Scratch Grains.....	Washington .....	10.34

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
9.69	10.00	2.64	3.00	3.54	6.00	Cracked corn, oats, wheat, Kaffir corn, buckwheat, barley, Heneta, sunflower seed and charcoal.
18.56	19.00	4.66	5.00	8.31	8.00	Corn meal, wheat bran, wheat middlings, alfalfa meal, beef scrap and linseed oil meal. Corn gluten feed guaranteed but not identified.
9.69	9.00	3.65	2.00	2.36	2.00	Corn, cracked corn, oats, wheat, rye, buckwheat, Kaffir corn and sunflower seed.
10.81	9.00	3.61	2.50	2.29	4.00	Cracked corn, Kaffir corn, wheat, buckwheat, sunflower seed and barley. Oats and cockle identified but not guaranteed.
16.94	15.00	4.64	5.00	5.05	9.00	Wheat middlings, wheat bran, corn meal, linseed oil meal, alfalfa meal, charcoal and beef scrap.
10.63	9.00	3.51	2.50	1.81	4.00	Cracked corn, Kaffir corn, wheat, barley and buckwheat. Sunflower seed guaranteed but not identified.
10.94	10.25	3.23	3.69	2.38	4.09	Wheat, corn, buckwheat, barley, cracked corn and Kaffir corn. Oats, rice and damaged wheat identified but not guaranteed.
15.13	12.00	4.27	3.00	7.80	10.00	Ground corn, wheat bran, alfalfa meal, ground meat and bone, wheat middlings and corn bran.
10.50	9.00	3.45	3.00	2.04	2.50	Cracked corn, buckwheat, wheat and Kaffir corn.
18.00	19.44	4.90	4.76	5.64	5.30	Wheat bran, corn meal, ground oats, ground meat and linseed cake meal.
10.63	10.50	3.59	3.25	3.88	3.50	Cracked corn, wheat, oats, Kaffir corn, charcoal, sunflower seed, buckwheat, barley and cracked rice.
11.00	9.80	3.89	3.00	2.49	3.75	Cracked corn, cracked wheat, cracked rice, millet, charcoal, grit and ground meat. Ground peas identified but not guaranteed.
16.44	16.63	4.05	4.45	7.06	8.15	Ground oats, wheat bran, wheat middlings, alfalfa meal, corn meal, corn gluten feed, beef scrap and charcoal. Rye bran and rye middlings identified but not guaranteed.
10.69	10.88	3.70	3.58	2.33	2.83	Cracked corn, sunflower seed, wheat, oats, Kaffir corn and wheat screenings. Barley guaranteed but not identified.
10.94	10.00	3.26	3.00	2.39	8.00	Cracked corn, screenings from wheat, sunflower seed, wheat, barley, Kaffir corn, buckwheat and rye. Oats guaranteed but not identified.
10.75	9.00	3.09	3.00	2.02	3.00	Cracked corn, wheat, buckwheat, Kaffir corn and oats.
11.00	9.54	3.76	2.59	2.43	4.98	Wheat, barley, Kaffir corn, buckwheat, oats, milo-maize, cracked corn and sunflower seed.
19.44	17.60	6.40	5.00	5.07	6.30	Wheat middlings, wheat bran, corn meal, ground oats, linseed oil meal and beef scrap.
9.50	9.00	2.96	2.00	3.36	4.00	Wheat, corn, oats, buckwheat, Kaffir corn and grit.
10.00	9.50	3.00	3.00	2.38	4.00	Barley, Kaffir corn, sunflower seed, oats, wheat, cracked corn and buckwheat.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16740	C. H. Leonard Co., Boonton, N. J. Success Scratching Grains.....	Boonton .....	10.58
16380	Limond & Co., Hoboken, N. J. Limond's Dry Mash .....	Leonia .....	8.67
16153	Limond's Scratch Feed .....	Freehold .....	10.92
16470	Limond's Baby Chick Feed .....	Hoboken .....	10.03
16473	Limond's Chicken Feed .....	Hoboken .....	10.52
16500	Limond's Pigeon Food .....	Hoboken .....	10.56
16270	C. A. Lippincott & Bro., Moorestown, N. J. O. K. Mash Food.....	Moorestown .....	7.55
16203	O. K. Scratch Food.....	Moorestown .....	11.33
16505	Long Dock Mills, Jersey City, N. J. Londone Scratch Feed.....	Jersey City .....	11.40
16506	Florida Scratch Feed.....	Jersey City .....	10.81
16508	Florida Laying Mash.....	Jersey City .....	8.59
16389	Geo. C. Lundy, Delaware, N. J. Lundy's Scratch Grains.....	Delaware .....	11.38
16765	Lunger Grain and Elevator Co., Netcong, N. J. Lunger Special Scratching Grains.....	Netcong .....	10.68
16767	Lunger Perfection Mash.....	Netcong .....	8.15
16693	F. Maier & Sons, South Orange, N. J. Scratch Food .....	South Orange ...	10.59
16501	Manhattan Chicken Food Co., Jersey City, N. J. Manhattan Scratch .....	Jersey City .....	10.70
16502	Manhattan Mash .....	Jersey City .....	7.84
16685	A. M. Matthews & Co., Orange, N. J. Chicken Scratch Feed.....	Orange .....	10.19
160001	McMurtrie Milling Co., Belvidere, N. J. Mixed Grains .....	Belvidere .....	10.91
16643	Meyer & De Vogel, Paterson, N. J. M. & D. Chicken Feed.....	Paterson .....	10.67
16781	John H. Miller, Rockaway, N. J. Poultry Scratching Grain.....	Rockaway .....	10.38

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
9.63	9.50	3.83	2.50	1.97	4.00	Cracked corn, wheat, Kaffir corn and buckwheat. Sunflower seed guaranteed but not identified.
19.50	18.15	5.80	5.16	6.58	7.17	Wheat bran, corn meal, wheat middlings, linseed oil meal, meat scrap and crushed oats.
10.81	9.76	2.97	3.13	2.49	2.45	Cracked corn, wheat, Kaffir corn, barley, buckwheat and sunflower seed. Oats identified but not guaranteed.
10.81	10.50	2.48	2.20	2.79	3.07	Cracked corn, wheat, Kaffir corn and millet. Oats identified but not guaranteed.
10.31	9.75	3.92	3.25	1.97	2.21	Whole corn, wheat, barley and buckwheat. Oats identified but not guaranteed.
10.50	10.50	3.01	2.86	1.83	2.58	Cracked corn, wheat, Kaffir corn, buckwheat and peas.
21.25	20.00	5.24	7.00	4.48	8.25	Wheat bran, corn meal, corn gluten feed, meat meal, wheat middlings and Heneta.
11.50	10.00	3.64	4.25	2.94	4.50	Cracked corn, Kaffir corn, wheat, oats, barley and hemp.
10.81	10.00	3.69	2.00	1.93	5.00	Corn, wheat, Kaffir corn, barley, oats, buckwheat and sunflower seed. Damaged wheat identified.
10.69	10.00	3.88	4.00	1.48	8.00	Corn, wheat, milo-maize, Kaffir corn, barley, sunflower seed and oats. Damaged wheat identified.
16.88	15.00	6.07	4.00	8.56	9.00	Alfalfa meal, corn bran, corn germ meal, wheat bran, wheat middlings, ground screenings, meat scrap, linseed oil meal and salt. Ground corn identified but not guaranteed.
10.19	10.00	3.32	3.00	1.96	3.60	Barley, buckwheat, wheat, cracked corn, oats and Kaffir corn.
10.13	10.00	3.09	3.00	2.00	4.50	Cracked corn, wheat, buckwheat, sunflower seed, Kaffir corn, barley and oats. Damaged wheat identified.
18.44	18.00	3.86	4.00	8.88	12.00	Wheat bran, wheat middlings, oats, corn, corn gluten feed, alfalfa meal and beef scrap.
9.94	10.50	3.70	4.05	2.72	3.30	Wheat, corn, barley, oats, Kaffir corn and buckwheat. Sunflower seed guaranteed but not identified.
10.88	3.49	3.31	3.78	2.39	1.96	Corn, cracked corn, barley, buckwheat, Kaffir corn and wheat screenings.
18.00	3.56	4.93	3.69	5.04	8.28	Corn meal, wheat bran, wheat middlings, beef scrap, alfalfa meal and grit. Ground oats and charcoal guaranteed but not identified. Cottonseed meal identified but not guaranteed.
9.75	9.88	2.54	2.62	2.49	2.99	Cracked corn, wheat, buckwheat, barley, Kaffir corn and charcoal.
10.44	10.00	3.49	3.00	2.46	7.00	Wheat, cracked corn, Kaffir corn, broom corn, buckwheat, oats and barley. Sunflower seed guaranteed but not identified.
10.31	10.00	3.38	2.00	2.43	4.00	Wheat, barley, cracked corn, Kaffir corn and buckwheat.
9.50	10.00	3.14	3.00	2.88	6.00	Cracked corn, wheat, buckwheat and Kaffir corn. Sunflower seed guaranteed but not identified. Oats identified but not guaranteed.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	<b>Millville Flour and Grain Co., Millville, N. J.</b>		
160255	Dry Mash .....	Millville .....	10.32
160256	Scratch Feed .....	Millville .....	11.23
	<b>C. P. Mohrfeld, Collingswood, N. J.</b>		
160356	Ideal Mash Feed .....	Collingswood .....	8.64
160357	Ideal Scratch Feed .....	Collingswood .....	11.66
	<b>A. J. Mowerson &amp; Co., Wyckoff, N. J.</b>		
16442	Scratch Feed .....	Wyckoff .....	11.89
	<b>N. J. Poultry Supply Co., Newark, N. J.</b>		
16524	Laying Mash .....	Newark .....	10.03
16522	Scratch Food .....	Newark .....	10.27
16523	Egg Ration .....	Newark .....	9.80
	<b>Nischwitz &amp; Son, Inc., Plainfield, N. J.</b>		
16362	Nischwitz Poultry Mash.....	Plainfield .....	8.36
16363	Nischwitz Mixed Grains.....	Plainfield .....	10.65
	<b>J. F. Noll &amp; Co., Newark, N. J.</b>		
16596	Noll's Economy Brand Mash Food.....	Newark .....	7.55
16590	Noll's Economy Brand Scratch Food.....	Newark .....	10.42
	<b>Peter O'Brien, Paterson, N. J.</b>		
16637	O. B. Scratch Feed.....	Paterson .....	10.95
	<b>R. J. O'Brien &amp; Bro. Co., Passaic, N. J.</b>		
16561	Pink Tag Poultry Mash.....	Passaic .....	7.83
16560	Pink Tag Scratching Grains.....	Passaic .....	11.37
16562	Pink Tag Mixed Chicken Feed.....	Passaic .....	10.88

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
18.63	18.78	5.33	5.23	4.28	3.90	Wheat bran, wheat middlings, corn meal, alfalfa meal, beef scrap and corn gluten feed.
10.00	10.50	3.69	3.58	2.21	2.73	Cracked corn, wheat, oats, barley, buckwheat, sunflower seed and Kaffir corn.
17.81	17.00	6.20	4.25	9.48	8.50	Wheat bran, wheat middlings, corn meal, ground oats, charcoal, alfalfa meal, corn gluten feed, fish, meat and bone, and linseed oil meal.
9.75	10.50	2.69	3.00	2.64	3.00	Cracked corn, wheat, barley, oats, Kaffir corn, buckwheat, sunflower seed and wheat screenings.
10.19	10.00	3.29	3.00	2.09	2.00	Corn, wheat, buckwheat and Kaffir corn. Barley guaranteed but not identified. Damaged wheat identified.
12.44	14.88	3.23	4.69	4.47	4.39	Corn meal, wheat middlings, wheat bran, alfalfa meal, bone meal, corn gluten feed and beef scrap. Linseed oil meal guaranteed but not identified.
9.94	10.38	3.02	3.35	2.40	2.50	Whole corn, cracked corn, wheat, buckwheat, Kaffir corn, sunflower seed, charcoal. Beef scrap and grit guaranteed but not identified. Barley identified but not guaranteed.
10.13	12.00	2.73	3.26	2.78	3.33	Cracked corn, wheat, Kaffir corn, buckwheat, sunflower seed and charcoal. Beef scrap guaranteed but not identified. Barley and oats identified but not guaranteed.
20.75	17.75	4.77	5.71	7.92	10.34	Ground oats, ground barley, corn meal, beef scrap, wheat bran and alfalfa meal. Wheat middlings, corn gluten feed, linseed oil meal and cottonseed meal identified but not guaranteed.
9.56	10.38	3.27	3.69	2.78	2.40	Corn, cracked corn, wheat, oats, buckwheat, Kaffir corn and barley. Sunflower seed guaranteed but not identified.
12.88	20.00	3.08	3.50	5.81	14.00	Wheat bran, wheat middlings, oats, corn gluten feed, alfalfa meal and corn meal. Poultry meat guaranteed but not identified. Heneta identified but not guaranteed.
10.50	10.50	3.12	2.56	2.15	4.00	Kaffir corn, corn, wheat, barley and buckwheat. Sunflower seed guaranteed but not identified. Oats identified but not guaranteed.
11.00	10.00	3.00	3.40	2.44	3.00	Cracked corn, wheat, barley, Kaffir corn, buckwheat and sunflower seed. Peas guaranteed but not identified. Oats identified but not guaranteed.
16.63	17.00	4.49	4.00	8.90	6.20	Wheat middlings, wheat bran, corn meal, linseed oil meal, alfalfa meal, salt, beef scrap and ground oats.
10.06	10.00	2.80	3.00	2.79	2.20	Cracked corn, barley, buckwheat, Kaffir corn and wheat. Sunflower seed guaranteed but not identified. Oats identified but not guaranteed.
10.06	9.94	3.02	3.50	2.13	2.25	Cracked corn, corn, barley, buckwheat, Kaffir corn and wheat.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16350	Oradell Flour, Feed and Grain Co., Oradell, N. J. Oradell Hen Mash.....	Oradell .....	8.62
16351	Oradell Scratching Feed.....	Oradell .....	9.72
16379	J. I. Pickens, Ridgefield, N. J. Chicken Feed .....	Ridgefield .....	9.96
16395	Chicken Feed—no whole corn.....	Ridgefield .....	10.55
16691	Estate of H. L. Pierson, South Orange, N. J. Laying Food .....	Maplewood .....	8.45
16689	Mixed Grain or Scratch Food.....	Maplewood .....	11.00
16566	John Post, Passaic, N. J. J. P. Dry Mash.....	Passaic .....	8.10
160207	J. M. Reeder, Bordentown, N. J. Oakland Poultry Mash.....	Bordentown .....	8.21
160054	W. H. Reger & Son, White House, N. J. Scratch Food .....	White House .....	9.54
16771	The Geo. Richards Co., Dover, N. J. Richards Poultry Mash Mixture.....	Dover .....	8.22
16770	Richards Chick Grain.....	Dover .....	9.93
16772	Richards Mixed Poultry Grains.....	Dover .....	11.15
160353	Rockhill & Fowler, Haddonfield, N. J. R. & F. Mash Feed.....	Haddonfield .....	10.02
16451	Chas. Schaefer & Son, Townley, N. J. American Standard Scratch Feed.....	Townley .....	9.30
160081	Seudder & Smith, Titusville, N. J. Chicken Mash .....	Titusville .....	9.07
160203	I. Serata & Sons, Bridgeton, N. J. Scratch Feed .....	Bridgeton .....	11.19
16074	Sharplers & Bro., Camden, N. J. Royal Mash Food .....	Camden .....	9.86
16081	Royal Scratching Food .....	Camden .....	11.32
160361	Royal Chick Food .....	Camden .....	10.93

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
18.19	18.88	5.77	4.97	7.48	5.11	Corn meal, wheat bran, wheat middlings, corn gluten feed and meat scrap. <b>Alfalfa meal, dried beet pulp and ground wheat screenings identified but not guaranteed.</b>
10.31	10.25	3.11	3.42	1.77	2.96	Wheat, cracked corn, barley, buckwheat and Kaffir corn. <b>Sunflower seed and charcoal guaranteed but not identified. Oats identified but not guaranteed.</b>
10.63	9.00	3.45	4.00	4.21	3.00	Cracked corn, buckwheat, Kaffir corn, wheat and oats. <b>Oyster shell guaranteed but not identified.</b>
9.50	11.00	3.34	2.00	2.89	5.00	Cracked corn, wheat, oats, buckwheat and Kaffir corn. <b>Oyster shell identified but not guaranteed.</b>
19.75	19.25	4.74	4.25	7.29	7.75	Wheat bran, corn meal, corn gluten feed, beef scrap, alfalfa meal, linseed oil meal and wheat middlings.
10.63	10.50	3.14	3.00	3.01	4.50	Cracked corn, wheat, Kaffir corn, buckwheat, sunflower seed, oats and barley.
17.25	18.31	5.14	4.97	9.17	7.81	Wheat bran, wheat middlings, ground oats, corn meal, corn gluten feed, meat scrap and alfalfa meal.
15.00	15.69	4.10	4.05	10.64	8.28	Beef scrap, corn gluten feed, alfalfa meal, corn meal, ground oats, wheat bran, wheat middlings, charcoal and salt.
10.31	10.44	3.67	2.77	3.09	1.93	Cracked corn, wheat, oats and buckwheat.
21.69	20.00	3.72	4.50	5.51	8.00	Wheat bran, corn gluten feed, corn meal, linseed oil meal and wheat middlings.
12.75	13.25	3.54	4.00	2.95	6.00	Cracked wheat, oat meal, millet, canary seed, hemp, beef scrap and charcoal. <b>Kaffir corn and rice identified but not guaranteed.</b>
10.31	10.25	3.58	3.10	2.55	4.00	Wheat, corn, barley, buckwheat, Kaffir corn, milo-maize, hemp, sunflower seed and peas. <b>Oats identified but not guaranteed.</b>
16.38	15.00	3.87	3.00	6.65	8.00	Ground corn, wheat bran, alfalfa meal, wheat middlings, ground oats, ground flaxseed, corn gluten feed, charcoal and ground meat. <b>Malt sprouts guaranteed but not identified.</b>
10.81	11.00	3.47	3.50	3.40	9.00	Wheat, oats, Kaffir corn, buckwheat, wheat screenings, cracked corn, milo-maize and cracked peas. <b>Hulled oats guaranteed but not identified.</b>
16.25	17.00	4.38	4.00	9.72	10.00	Wheat bran, wheat middlings, ground oats, corn meal, corn gluten feed, meat scrap, alfalfa meal, charcoal and salt. <b>Cottonseed meal identified but not guaranteed.</b>
10.69	10.63	3.90	3.51	3.39	2.60	Kaffir corn, corn, hemp, sunflower seed, oats, wheat, buckwheat, millet, peas and grit.
14.06	12.00	3.26	3.00	7.76	12.00	Alfalfa meal, ground oats, wheat middlings, corn gluten feed, corn meal and wheat bran.
9.75	10.00	4.16	2.50	2.68	3.00	Cracked corn, barley, oats, wheat, Kaffir corn, sunflower seed, wheat screenings and buckwheat.
9.44	10.00	3.04	2.50	2.78	3.00	Millet, cracked wheat, Kaffir corn, rice and cracked corn.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16066	Sitley & Son, Inc., Camden, N. J. S. & S. Scratching Feed.....	Camden .....	10.15
16067	Peerless Scratching Feed .....	Camden .....	10.74
16068	Peerless Mash Food .....	Camden .....	9.09
16069	Peerless Chick Food .....	Camden .....	10.57
16070	Peerless Pigeon Food .....	Camden .....	10.63
16078	S. & S. Chick Feed.....	Camden .....	11.19
160365	Peerless Developing Feed.....	Camden .....	9.58
160064	Slater & Jones, High Bridge, N. J. Hen Food No. 2.....	High Bridge .....	11.71
16012	Stephen Smedley, Glassboro, N. J. Makes-Em Developing Food .....	Glassboro .....	8.86
160390	Laysum Dry Mash.....	Glassboro .....	9.43
160092	Jos. Smith & Co., Stockton, N. J. Smith's Dry Mash for Poultry.....	Stockton .....	9.52
160277	T. C. Souder & Son, Millville, N. J. Souder's Scratch Feed.....	Millville .....	9.90
16536	Spratt's Patent, Ltd., Newark, N. J. Spratt's Patent Growing Mash Food .....	Newark .....	7.60
16538	Spratt's Patent Poultry Food .....	Newark .....	5.37
16600	Spratt's Patent Egg Mash Food .....	Newark .....	7.75
16601	Spratt's Patent Developing Food .....	Newark .....	9.20
16537	Spratt's Patent Scratch Food.....	Newark .....	10.37
16539	Spratt's Patent Chick Grain .....	Newark .....	9.63
16541	Spratt's Patent Chick Meal .....	Newark .....	5.64

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
10.06	8.00	3.08	3.00	1.96	5.00	Sunflower seed, barley, oats, Kaffir corn, corn and wheat. Buckwheat guaranteed but not identified. Grit identified but not guaranteed.
10.88	10.00	2.98	3.00	7.50	5.00	Sunflower seed, barley, Kaffir corn, buckwheat, wheat and corn. Ground meat and millet guaranteed but not identified. Oats identified but not guaranteed.
16.44	15.00	5.60	4.00	8.92	8.00	Oats, corn, salt, wheat middlings, wheat bran, meat scrap. Alfalfa meal and linseed oil meal identified but not guaranteed.
10.00	10.00	3.06	2.00	2.25	5.00	Corn, wheat, Kaffir corn, millet and hulled oats. Rice guaranteed but not identified.
13.50	10.00	3.98	3.00	3.21	5.00	Kaffir corn, millet, peas, hemp, corn, buckwheat and wheat. Flaxseed and rice guaranteed but not identified.
9.75	8.00	3.17	2.00	1.70	5.00	Corn, wheat, Kaffir corn, millet and wheat screenings. Oats guaranteed but not identified.
10.75	10.00	4.41	4.00	3.58	5.00	Hemp, wheat, Kaffir corn, oats, barley and millet.
9.69	11.50	3.06	3.50	3.80	3.00	Cracked corn, wheat, buckwheat and oats. Barley guaranteed but not identified.
21.88	21.00	8.28	7.50	3.17	4.00	Meat scrap, ground corn, corn gluten feed, cottonseed meal and wheat middlings.
20.75	20.00	5.69	6.00	5.74	7.00	Wheat bran, alfalfa meal, corn meal, wheat middlings, corn gluten feed, linseed oil meal, ground oats, beef scrap and salt. Cottonseed meal guaranteed but not identified.
17.44	14.00	5.34	4.00	11.16	15.00	Beef scrap, charcoal, alfalfa meal, wheat middlings, wheat bran, ground oats, hominy feed and corn gluten feed.
10.13	10.00	4.09	1.50	4.24	6.00	Whole corn, whole oats, wheat, barley, buckwheat, sunflower seed, milo-maize, Kaffir corn, charcoal and cracked corn. Damaged wheat, shell and grit identified but not guaranteed.
21.50	22.00	5.34	4.50	6.96	8.00	Wheat, bran, wheat middlings, corn meal, alfalfa meal, ground meat, ground buckwheat, ground bone, ground charcoal and ground peas. Ground rice and ground Kaffir corn guaranteed but not identified.
19.69	20.00	2.32	3.50	0.82	2.00	Wheat flour and meat scrap.
20.31	23.00	5.23	4.50	4.63	8.00	Wheat bran, corn meal, alfalfa meal, ground meat, ground bone, ground charcoal and ground peas. Wheat, ground rice, ground Kaffir corn and ground buckwheat guaranteed but not identified.
11.50	12.00	3.38	2.00	1.84	8.00	Whole or ground corn, pop-corn, meat, peas, Kaffir corn, buckwheat, wheat and bone.
12.00	12.00	3.41	2.00	2.43	8.00	Whole or ground wheat, millet, Kaffir corn, peas, hemp, buckwheat, pop-corn, rice, sunflower seed, corn, meat scrap, charcoal, bone and barley.
14.00	14.00	3.16	3.00	3.73	5.00	Whole or ground wheat flour, wheat, millet, canary seed, Kaffir corn, peas, hemp, buckwheat, pop-corn, rice, meat scrap, charcoal and bone.
21.19	20.00	2.95	2.00	1.16	2.00	Wheat flour and meat scrap.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
16915	<b>Stamets &amp; Pursel, Phillipsburg, N. J.</b> Rising Sun Poultry Mash.....	Phillipsburg .....	9.65
16435	<b>Star K Poultry Feed Co., Waldwick, N. J.</b> Star K Scratching Grains.....	Waldwick .....	11.55
16436	Star K Laying Mash.....	Waldwick .....	10.20
16162	<b>W. N. Steward, Englishtown, N. J.</b> Scratch Feed .....	Englishtown .....	10.78
160399	<b>S. A. Stewart, Woodbury, N. J.</b> Dry Mash .....	Woodbury .....	9.15
160398	Scratch Feed .....	Woodbury .....	10.26
160123	<b>Z. V. Stillwell, Villa Park, N. J.</b> Dry Mash .....	Villa Park .....	8.43
16905	<b>W. W. Supplee, Hampton, N. J.</b> Scratch Feed .....	Hampton .....	10.87
16013	<b>Taylor Bros., Camden, N. J.</b> Keystone Developing Food.....	Camden .....	11.38
16014	Keystone Mash Food.....	Camden .....	10.04
16015	Keystone Dry Mash .....	Camden .....	10.32
16016	Keystone Pheasant Food .....	Camden .....	10.01
16017	Keystone Baby Chick Food .....	Camden .....	10.26
16018	Keystone Pigeon Food "A" .....	Camden .....	10.93
16019	Keystone Scratching Food .....	Camden .....	11.14
16020	Keystone Duck Food .....	Camden .....	9.15
16021	Keystone Forcing Food .....	Camden .....	9.93
16022	Dandy Scratching Food .....	Camden .....	10.75
16023	Keystone Chick Food .....	Camden .....	10.79
16024	Uncle Sam Scratch Food .....	Camden .....	11.04
16025	Keystone Pullet Food .....	Camden .....	11.49

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
16.94	10.00	4.69	3.00	6.33	5.00	Wheat bran, wheat middlings, corn chop, alfalfa meal, linseed oil meal, corn gluten feed and beef scrap. <b>Ground oats guaranteed but not identified.</b>
11.00	9.88	2.77	2.85	2.17	3.06	Cracked corn, wheat, barley, Kaffir corn and buckwheat.
17.13	17.81	5.47	4.42	7.89	7.52	Wheat bran, wheat middlings, corn meal, corn gluten feed and linseed oil meal.
10.69	.....	3.22	.....	2.55	.....	Whole and cracked corn, barley, buckwheat, Kaffir corn, wheat, oats and sunflower seed.
19.94	19.69	4.24	5.27	8.68	6.57	Wheat bran, wheat middlings, corn meal, alfalfa meal, corn gluten feed, ground meat and ground oats. <b>Charcoal guaranteed but not identified.</b>
9.94	11.79	3.36	3.59	2.52	2.36	Cracked corn, wheat, sunflower seed, oats, barley, buckwheat, Kaffir corn, millet and ground meat.
18.94	20.25	5.10	4.53	8.03	5.58	Wheat bran, corn meal, oats, linseed oil meal, meat scrap, charcoal, cottonseed meal, wheat middlings, corn gluten feed, alfalfa meal and Heneta.
10.25	9.00	2.99	3.00	2.42	3.00	Cracked corn, wheat, oats, buckwheat and Kaffir corn. <b>Sunflower seed guaranteed but not identified.</b>
10.69	9.50	3.18	2.75	2.40	3.00	Wheat, corn, Kaffir corn, milo-maize and millet.
13.81	13.00	3.43	3.00	10.49	10.00	Alfalfa meal, corn meal, peanut meal, beet pulp, pea meal and salt. <b>Cracked Kaffir corn, cottonseed meal and wheat middlings identified but not guaranteed.</b>
16.31	15.00	4.14	4.00	4.45	5.00	Wheat middlings, corn meal, wheat bran, ground oats, meat scrap, bone meal, peanut meal, beet pulp, pea meal and salt. <b>Cracked wheat identified but not guaranteed.</b>
14.13	12.00	3.19	3.00	2.47	3.00	Ground meat, millet, Kaffir corn, milo-maize, ground bone, wheat, rice and cracked corn.
13.94	13.00	4.10	4.00	2.00	3.00	Wheat, corn, Kaffir corn, oat groats, millet, ground meat and grit. <b>Charcoal guaranteed but not identified.</b> Wheat screenings identified but not guaranteed.
13.38	13.00	3.68	3.00	2.92	4.00	Wheat, peas, Kaffir corn, milo-maize, buckwheat, millet, hemp and corn.
11.50	11.00	4.33	3.00	3.02	3.00	Wheat screenings, wheat, barley, Kaffir corn, milo-maize, millet, hemp, sunflower seed, buckwheat, corn and peas.
17.06	16.00	6.03	6.50	5.55	4.00	Corn, ground meat, linseed oil meal, wheat middlings, pea meal, beet pulp and salt. <b>Ground Kaffir corn identified but not guaranteed.</b>
13.63	13.00	4.66	4.00	3.50	3.00	Corn, Kaffir corn, bone meal, meat scrap, peanut meal, wheat middlings, beet pulp and salt.
11.44	10.50	3.87	3.00	3.29	3.00	Wheat screenings, wheat, barley, millet, sunflower seed, buckwheat, corn, peas, shell and grit.
12.81	11.00	5.03	3.00	2.56	3.00	Wheat, corn, Kaffir corn, milo-maize, millet, hulled oats and ground meat.
10.06	10.00	4.59	4.50	2.08	.....	Cracked corn, wheat, barley, milo-maize, Kaffir corn, buckwheat and sunflower seed.
12.50	12.00	2.70	3.00	2.60	10.00	Peas, corn, Kaffir corn, milo-maize, wheat, grit, millet, buckwheat and barley.

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.
	Taylor Bros., Camden, N. J.—Continued.		
16026	Dandy Chick Food .....	Camden .....	11.03
16027	Keystone Laying Food .....	Camden .....	9.06
16028	Keystone Pigeon Food "B" .....	Camden .....	11.45
	Terhune's Poultry Supply and Feed Co., Hackensack, N. J.		
16329	Terhune's Laying Mash—Egg Brand.....	Hackensack .....	8.36
	J. A. Tiger, Califon, N. J.		
16814	Tiger's Poultry Grains.....	Califon .....	10.82
	Wm. S. Vroom, Somerville, N. J.		
16936	Vroom's Perfect Mash.....	Somerville .....	7.77
16937	Vroom's Scratching Feed .....	Somerville .....	10.38
	J. P. Wallace, Phillipsburg, N. J.		
16914	Daybreak Poultry Mash.....	Phillipsburg .....	9.19
16913	Mary Dee Scratch Food.....	Phillipsburg .....	10.43
	Westwood Feed Co., Westwood, N. J.		
16347	Dry Mash .....	Westwood .....	8.42
	Wilkinson, Gaddis & Co., Newark, N. J.		
16626	Ideal Brand Chicken Feed Mash .....	Newark .....	7.55
16131	Ideal Brand Scratch Feed .....	Freehold .....	10.92
16627	Ideal Brand Chick Feed .....	Newark .....	8.91
	Thos. Wood, Montclair, N. J.		
10609	Merit Scratching Grains.....	Montclair .....	11.50
	Vernon Wortman, Pottersville, N. J.		
16878	Dry Mash .....	Pottersville .....	9.25
	W. H. H. Wyckoff Co., Somerville, N. J.		
16925	Wyckoff's Dry Mash.....	Somerville .....	7.37
16926	Wyckoff's Scratch Food.....	Somerville .....	9.26

## POULTRY FOODS (NEW JERSEY MANUFACTURERS)—Continued.

PROTEIN.		FAT.		FIBER.		PRINCIPAL INGREDIENTS IDENTIFIED.
Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
11.19	10.00	3.42	3.00	2.21	3.00	Wheat screenings, corn, Kaffir corn, millet, hulled oats and barley.
20.75	18.75	5.06	4.00	8.44	9.00	Alfalfa meal, cottonseed meal, corn, meat scrap, bone meal, wheat middlings, peanut meal, beet pulp, salt and mustard oil cake meal. Shell dust guaranteed but not identified. Ground peas identified but not guaranteed.
12.31	12.00	3.30	2.75	2.80	3.00	Corn, peas, wheat, Kaffir corn, milo-maize, buckwheat, millet and hemp.
17.44	18.00	5.61	3.00	6.02	10.00	Wheat bran, wheat middlings, corn meal, corn gluten feed, ground oats, meat scrap, alfalfa meal, linseed oil meal and charcoal.
10.69	8.00	2.89	2.00	1.99	3.00	Cracked corn, wheat, barley, buckwheat and Kaffir corn. Sunflower seed guaranteed but not identified.
15.81	14.00	4.60	5.00	6.93	10.00	Wheat bran, corn meal, ground oats, wheat middlings, corn gluten feed, alfalfa meal and beef scrap. Heneta and cottonseed meal identified but not guaranteed.
10.38	8.00	3.96	3.00	2.49	4.00	Cracked corn, wheat, oats, barley, buckwheat, Kaffir corn, sunflower seed and charcoal.
16.31	13.25	5.02	4.00	7.14	12.00	Wheat bran, wheat middlings, beef scrap, corn chop, alfalfa meal, ground oats and corn gluten feed. Linseed oil meal identified but not guaranteed.
10.31	8.00	2.84	2.00	3.53	5.00	Cracked corn, wheat, oats, buckwheat, barley and Kaffir corn. Rye identified but not guaranteed.
16.25	15.00	5.47	3.00	6.81	10.00	Meat scrap, alfalfa meal, corn meal, ground oats, corn gluten feed, wheat bran and wheat middlings.
16.06	20.00	4.51	3.50	6.85	14.00	Wheat bran, wheat middlings, oats, corn gluten feed, alfalfa meal, meat scrap and corn meal.
10.50	10.50	2.87	2.56	2.79	4.00	Kaffir corn, corn, wheat, barley and buckwheat. Sunflower seed guaranteed but not identified. Oats identified but not guaranteed.
10.63	10.00	3.95	3.50	2.38	3.00	Corn, Kaffir corn, wheat, oatmeal, millet, rape and hemp.
10.69	10.00	3.00	3.00	1.81	5.00	Corn, oats, buckwheat, barley, Kaffir corn, wheat, peas and sunflower seed.
15.69	16.50	4.81	4.50	9.32	7.10	Wheat bran, wheat middlings, ground corn, oats, alfalfa meal, meat scrap and charcoal.
19.81	12.00	4.68	2.25	7.80	9.41	Corn meal, wheat bran, beef scrap, linseed oil meal, wheat middlings, alfalfa meal and ground oats. Gluten meal, Heneta and Blatchford's poultry meat guaranteed but not identified. Ground Kaffir corn and charcoal identified but not guaranteed.
9.31	8.25	2.67	2.30	2.32	5.13	Wheat, barley, cracked corn, oats, buckwheat, Kaffir corn, sunflower seed, charcoal, grit, oyster shell and Heneta.

# POULTRY MEAT.

Station Number.	MANUFACTURER OR JOBBER AND BRAND NAME.	PLACE OF SAMPLING.	Moisture.		PROTEIN.		FAT.	
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
16748	American Agricultural Chemical Co., New York City.	Branchville	56.31	55.00	15.12	10.00		
16586	Pure Ground Meat Scrap.....	Paterson	50.31	50.00	12.08	11.00		
16076	Apco Poultry Meat.....	Camden	47.88	50.00	18.23	14.00		
16079	Baugh & Sons Co., Philadelphia, Pa.	Camden	25.00	27.00	1.20	3.00		
16123	Baugh's Meat Meal for Poultry.....	Moorestown	36.00	40.00	16.72	11.00		
16283	*Baugh's Special Ground Bone for Poultry.....	Pennington	50.13	50.00	14.78	15.00		
16440	The Berg Co., Philadelphia, Pa.	Wyckoff	45.00	50.00	22.73	15.00		
16776	Berg's 3 Medal Poultry Meat.....	Dover	47.00	50.00	14.75	12.00		
16047	The Brown Co., Trenton, N. J.	Red Bank	50.25	50.00	17.00	15.00		
16221	Capital Meat Scrap.....	Burlington	44.38	50.00	13.46	10.00		
16042	Henry Clausen, Teaneck, N. J.	Red Bank	49.81	45.00	1.99	2.00		
16204	Consolidated Dressed Beef Co., Philadelphia, Pa.	Moorestown	50.44	50.00	14.84	14.00		
16156	The Fritz Co., Philadelphia, Pa.	Spotswood	51.31	50.00	13.75	10.00		
16431	The Flavel Co., Ashury Park, N. J.	Paterson	56.81	55.00	14.50	10.00		
16346	Vin Beef Crackings.....	Westwood	46.31	48.00	14.47	12.00		
	Consolidated Beef Scrap.....							
	The Fritz Co., Philadelphia, Pa.							
	Ground Beef Scrap for Poultry.....							
	International Glue Co., Boston, Mass.							
	*Red Star Brand Fish Scrap.....							
	C. A. Lippincott & Bro., Moorestown, N. J.							
	Prepared Poultry Meat.....							
	Martin R. Maurer, Inc., Elizabeth, N. J.							
	Maurer's Kval-it-T Meat and Bone Scrap.....							
	Muzzy Bros., Paterson, N. J.							
	Specialty Prepared Ground Beef Scrap.....							
	Noll & Fisher, Newark, N. J.							
	Meat Scrap for Poultry.....							

\* Not included in the average.

# POULTRY MEAT—Continued.

16757	Quaker City Mfg. Co., Philadelphia, Pa.	Newton	6.93	47.25	50.00	13.47	10.00
16758	Quaker City Brand Meat and Bone Scrap for Poultry...	Camden	7.57	44.60	50.00	14.50	14.00
16880	Sharpless & Bro., Camden, N. J.	North Paterson	8.35	57.06	55.00	15.08	10.00
16422	Special Prepared Poultry Meat.	Camden	7.38	45.94	55.00	14.69	16.00
16071	M. L. Shoemaker & Co., Ltd., Philadelphia, Pa.	Peapack	8.24	48.19	43.00	12.82	11.00
16861	Sittley & Son, Inc., Camden, N. J.	Eatontown	6.28	43.00	40.00	12.11	8.00
16108	Peerless Prepared Poultry Meat.	Newark	6.54	24.94	25.00	1.47	5.00
16738	Spratt's Patent Ground Meat.	Millington	6.41	51.06	50.00	12.44	8.00
16795	Swift & Co., Harrison Sta., Newark, N. J.	Peapack	9.60	57.25	60.00	9.05	8.00
16882	Swift's Pure Poultry Bone—medium.	Somerville	9.29	83.94	87.00	0.26	.....
16927	Swift's Eureka Meat Scrap	Vineland	5.43	50.75	50.00	12.40	14.00
16927	Swift's Digester Tankage	Paterson	6.60	56.69	55.00	9.52	5.00
16927	Swift's Blood Meal	Hope	6.52	44.25	.....	11.05	.....
16928	Taylor Bros., Camden, N. J.	.....	6.65	49.09	.....	14.15	.....
160258	Special Prepared Poultry Meat (Keystone Brand)	.....	.....	.....	.....	.....	.....
16582	The Van Iderstine Co., Long Island City, N. Y.	.....	.....	.....	.....	.....	.....
16959	Darling's High Protein Meat Scrap.	.....	.....	.....	.....	.....	.....
16959	F. C. Williams, Easton, Pa.	.....	.....	.....	.....	.....	.....
16959	Diamond Meat Scrap.	.....	.....	.....	.....	.....	.....
	Average	.....	6.65	49.09	.....	14.15	.....

\* Not included in the average.

## REGISTRATIONS FOR YEAR 1916.

The following list gives the names and addresses of the manufacturers who have registered one or more brands of feeding stuffs that will be offered for sale during the year 1916. The detailed information regarding these brands is not given, but information will be furnished upon request regarding any particular brand that has been registered:

### A

Acme-Evans Co. ....	Indianapolis, Ind.
W. N. Adair & Co. ....	Raritan, N. J.
Alfocorn Milling Co. ....	East St. Louis, Ill.
Henry Allen ....	Eatontown, N. J.
American Agricultural Chemical Co. ....	New York City.
American Hominy Co. ....	Indianapolis, Ind.
American Linseed Co. ....	New York City.
American Maize-Products Co. ....	New York City.
American Malting Co. ....	New York City.
American Milling Co. ....	Peoria, Ill.
J. S. Amerman ....	Neshanic Sta., N. J.
Samuel Anderson ....	Hammonton, N. J.
Animal Products Co. ....	Philadelphia, Pa.
D. C. Apgar ....	Ralston, N. J.
P. E. Apgar ....	Bound Brook, N. J.
Henry R. Applegate ....	Hightstown, N. J.
Arcady Farms Milling Co. ....	Rondout, Ill.
Archer-Daniels Linseed Co. ....	Minneapolis, Minn.
Armour Fertilizer Works ....	Chicago, Ill.
Armstrong & Demarest ....	Lafayette, N. J.
The Asbury Co. ....	Spotswood, N. J.
Frank Atherton Grain Co. ....	Paterson, N. J.
Atlantic Export Co. ....	New York City.
C. C. Avis ....	Woodstown, N. J.

### B

J. J. Badenoch Co. ....	Chicago, Ill.
Dwight M. Baldwin, Jr. ....	Minneapolis, Minn.
P. Ballantine & Sons ....	Newark, N. J.
Barber Milling Co. ....	Minneapolis, Minn.
M. F. Baringer ....	Philadelphia, Pa.
C. Barker ....	Bernardsville, N. J.
Baugh & Sons Co. ....	Philadelphia, Pa.
Bay State Milling Co. ....	Winona, Minn.
H. U. Bean & Co. ....	Philadelphia, Pa.
Warren Beaty ....	Hackettstown, N. J.
B. M. Beidman ....	Merchantville, N. J.
H. Beidler & Co. ....	Philadelphia, Pa.
Samuel Bell & Sons ....	Philadelphia, Pa.
Belvidere Flouring Mill Co. ....	Belvidere, N. J.
George B. Benedict ....	Elizabeth, N. J.

The Berg Co.....	Philadelphia, Pa.
Bernet, Craft & Kauffman Milling Co.....	St. Louis, Mo.
Big Diamond Mills Co.....	Minneapolis, Minn.
Frank Bird .....	Flemington, N. J.
Fred R. Blamey.....	Bloomfield, N. J.
Blank & Gottshall.....	Sunbury, Pa.
Blatchford's Calf Meal Factory.....	Waukegan, Ill.
H. H. Blauvelt.....	Ridgewood, N. J.
Bodine & Co.....	Pittstown, N. J.
George Boggs & Son.....	West Collingswood, N. J.
J. Bolgiano & Son.....	Baltimore, Md.
E. Boone & Johnson Bros.....	Bridgeton, N. J.
S. W. Bowne Co.....	Brooklyn, N. Y.
S. B. Brewster.....	Woodbridge, N. J.
F. W. Brode & Co.....	Memphis, Tenn.
The Brown Co.....	Trenton, N. J.
Edward L. Bucher.....	Newark, N. J.
Buckeye Cereal Co.....	Massillon, O.
Buckeye Cotton Oil Co.....	Cincinnati, O.
Buffalo Cereal Co.....	Buffalo, N. Y.
Burtis, Conine & Son.....	Allentown, N. J.

## C

L. G. Campbell Milling Co.....	Owatonna, Minn.
Campbell, Morrell & Co.....	Passaic, N. J.
Carpenter & Knight, Inc.....	Morristown, N. J.
Carscallen & Cassidy.....	Jersey City, N. J.
F. P. Cassel & Son.....	Lansdale, Pa.
F. B. Chamberlain Co.....	St. Louis, Mo.
Chapin & Co.....	Hammond, Ind.
George C. Christian & Co.....	Minneapolis, Minn.
L. Christian & Co.....	Minneapolis, Minn.
Claro Milling Co.....	Waseca, Minn.
Henry Clausen .....	Teaneck, N. J.
Clover Leaf Milling Co.....	Buffalo, N. Y.
Cockley Milling Co.....	Lexington, O.
Harvey S. Cole.....	Washington, N. J.
Charles Collet .....	Jersey City, N. J.
J. S. Collins & Son, Inc.....	Moorestown, N. J.
Commander Mill Co.....	Minneapolis, Minn.
Commercial Mills and Elevator.....	Plainfield, N. J.
Commonwealth Feed Mills Co.....	St. Louis, Mo.
The G. E. Conkey Co.....	Cleveland, O.
E. W. Conklin & Son, Inc.....	Binghamton, N. Y.
J. M. Conover & Son.....	Bartley, N. J.
Consolidated Dressed Beef Co.....	Philadelphia, Pa.
Consumers Coal Co.....	Plainfield, N. J.
Corn Products Refining Co.....	New York City
Corno Mills Co.....	St. Louis, Mo.
George Cox & Sons.....	West Hoboken, N. J.
Thomas Craig .....	Buttsville, N. J.
Aaron D. Crane.....	Elizabeth, N. J.
Crane Bros. ....	Murray Hill, N. J.

C. H. Crisman.....	Branchville, N. J.
William G. Crocker.....	Minneapolis, Minn.
W. A. Crowell & Son.....	Metuchen, N. J.
Willard Curtis .....	Milford, N. J.
A. Cyphers Co.....	Newark, N. J.

## D

Darling & Co.....	Chicago, Ill.
J. S. Darnell.....	Trenton, N. J.
J. G. Davis Co.....	Rochester, N. Y.
J. Sanford Davis.....	Greenwich, N. J.
S. P. Davis.....	Little Rock, Ark.
E. H. Deats.....	Pittstown, N. J.
Decker & Simmons.....	Sussex, N. J.
C. C. Dempsey & Co.....	Gloucester City, N. J.
Denver Alfalfa Milling and Products Co.....	Hartman, Colo.
Deposit Milling Co.....	Deposit, N. Y.
Deutsch & Sickert Co.....	Milwaukee, Wis.
Albert Dickinson Co.....	Chicago, Ill.
Jacob Dold Packing Co.....	Buffalo, N. Y.
L. W. Dorland.....	High Bridge, N. J.
Douglas Company .....	Cedar Rapids, Iowa.
N. Drake .....	Newark, N. J.
Frank Dufford .....	Middle Valley, N. J.
Duluth-Superior Milling Co.....	Duluth, Minn.
Ezl. Dunwoody Co.....	Philadelphia, Pa.

## E

Eagle Roller Mill Co.....	New Ulm, Minn.
R. D. Eaton Grain and Feed Co.....	Norwich, N. Y.
H. F. H. Eberts.....	Little Rock, Ark.
Jonas F. Eby & Son.....	Lancaster, Pa.
B. A. Eckhart Milling Co.....	Chicago, Ill.
Edwards & Loomis Co.....	Chicago, Ill.
Eldredge & Phillips, Inc.....	Cape May City, N. J.
Frank S. Eldridge.....	Cranbury, N. J.
Empire Grain and Elevator Co.....	Binghamton, N. Y.
John W. Eshelman.....	Lancaster, Pa.
Evans Milling Co.....	Indianapolis, Ind.
Everett, Aughenbaugh & Co.....	Waseca, Minn.
Ewen Milling Co.....	Alloway, N. J.
Excello Feed Milling Co.....	St. Joseph, Mo.

## F

Faramel Manufacturing Co.....	Buffalo, N. Y.
Farmers' Feed Co.....	New York City.
Felt Bros. & Gage Co.....	Olean, N. Y.
H. S. Ferdon.....	Leonia, N. J.
The Ferger Grain Co.....	Cincinnati, O.
George W. Fisher.....	Port Murray, N. J.
The Flavell Co.....	Asbury Park, N. J.
B. Flecke .....	Englewood, N. J.
The Fleischmann Co.....	New York City.

Flemington Milling Co.....	Flemington, N. J.
Flory Milling Co.....	Bangor, Pa.
B. F. Fowler Co.....	Haddonfield, N. J.
George T. Freeman.....	Whippany, N. J.
T. D. Fritch & Sons.....	Bethlehem, Pa.
The Fritz Co.....	Philadelphia, Pa.

## G

C. A. Gambrill Manufacturing Co.....	Baltimore, Md.
Gambrill, Thomas Co.....	Frederick, Md.
Garden State Milling Co.....	Bordentown, N. J.
George F. Geisinger.....	Bridgeton, N. J.
Harry G. Gere Co., Inc.....	New York City.
J. D. Gibbs.....	Vienna, N. J.
Globe Elevator Co.....	Buffalo, N. Y.
Golden Grain Milling Co.....	East St. Louis, Ill.
D. H. Grandin Milling Co.....	Jamestown, N. Y.
Grigg Bros. Co.....	Lockport, N. Y.
Gross Bros. ....	Hightstown, N. J.
J. H. Grover & Son.....	Princeton Jct., N. J.

## H

Hackensack Grain and Hay Co.....	Hackensack, N. J.
John Hagaman .....	Perth Amboy, N. J.
Dwight E. Hamlin.....	Pittsburgh, Pa.
A. L. Hance.....	Hackettstown, N. J.
George W. Hand.....	Flanders, N. J.
Howard H. Hanks Co.....	Chicago, Ill.
A. Hanniball .....	Hoboken, N. J.
Reeve Harden .....	Hamburg, N. J.
Joseph Harrigan .....	Plainfield, N. J.
The Harrison Co.....	Caldwell, N. J.
Harrison Milling Co.....	Montclair, N. J.
F. D. Hartzel's Sons.....	Chalfont, Pa.
Hasselhuhn-Williams Co. ....	Rutherford, N. J.
Haywood Alfalfa Warehouse Co.....	Kansas City, Mo.
Hecker-Jones-Jewell Milling Co.....	Buffalo, N. Y.
Hecker-Jones-Jewell Milling Co.....	New York City.
G. C. Higgins & Son.....	Three Bridges, N. J.
The Hildebrant Co.....	Elizabeth, N. J.
M. R. Hildebrant, Jr.....	Flanders, N. J.
Alvin Hill & Son.....	Flemington, N. J.
G. F. Hill & Co.....	Gladstone, N. J.
Augustus Hipple .....	South Branch, N. J.
The H. O. Company.....	Buffalo, N. Y.
John Hoffer Flouring Mill Co.....	Steelton, Pa.
C. V. Hoffman.....	Lebanon, N. J.
I. A. Hoffman & Son.....	German Valley, N. J.
F. S. Hofmann.....	East Orange, N. J.
Holley & Smith.....	Hackensack, N. J.
E. Hollingshead .....	Moorestown, N. J.
J. C. Hopkins, Jr.....	Moorestown, N. J.
Hopkins, Hough & Merrell Co.....	Branchville, N. J.

The Hottel Co.....	Milwaukee, Wis.
J. A. Howell.....	Middletown, N. Y.
Howell & Sons.....	Trenton, N. J.
Hubbard Milling Co.....	Mankato, Minn.
J. C. Hubinger Bros. Co.....	Keokuk, Iowa.
E. J. Huff.....	Blairstown, N. J.
Barton Huffman.....	Ringoes, N. J.
W. F. Hummer.....	Milford, N. J.
Humphreys-Godwin Co. ....	Memphis, Tenn.
Estate of S. D. Hunsberger.....	Philadelphia, Pa.
Hutchinson Bros. ....	Crosswicks, N. J.
E. C. Hutchinson Milling Co.....	Trenton, N. J.

## I

Indiana Milling Co.....	Terre Haute, Ind.
H. B. Ingersoll.....	Hamburg, N. J.
International Glue Co.....	Boston, Mass.

## J

W. I. Jacoby.....	Finesville, N. J.
Jamestown Electric Mills.....	Jamestown, N. Y.
W. J. Jennison Co.....	Minneapolis, Minn.
R. S. Johnson.....	Bridgeton, N. J.
W. W. Johnson.....	Elmer, N. J.
Martin B. Jones & Co.....	New York City.
Jordon Elevator, Inc.....	New York City.

## K

Edward G. Kaufer.....	Fort Lee, N. J.
I. B. Keener.....	Belvidere, N. J.
Keever Starch Co.....	Columbus, O.
Spencer Kellogg & Sons, Inc.....	Buffalo, N. Y.
Kelloggs & Miller.....	Amsterdam, N. Y.
Kemper Mill and Elevator Co.....	Kansas City, Mo.
Keusch & Schwartz Co., Inc.....	New York City.
Kirby Bros. ....	Medford, N. J.
George H. Kirby.....	Allentown, N. J.
William Kirby.....	Etra, N. J.
J. C. Klauder Estate.....	Philadelphia, Pa.
John P. Klug.....	New Milford, N. J.
Knestner Bros. ....	Trenton, N. J.
H. W. Koch & Co.....	Philadelphia, Pa.
Kornfalfa Feed Milling Co.....	Kansas City, Mo.
John M. Kostenbader.....	Delaware, N. J.
Charles A. Krause Milling Co.....	Milwaukee, Wis.
G. Krueger Brewing Co.....	Newark, N. J.
George M. Kuhl.....	Flemington, N. J.

## L

Charles L. Lade.....	Morristown, N. J.
Morris E. Lamb.....	New Egypt, N. J.
Lambert & Kerr.....	Lambertville, N. J.

Lanier Bros. ....	Nashville, Tenn.
M. R. Lanning.....	Marksboro, N. J.
Larabee Flour Mills Co.....	Hutchinson, Kan.
J. P. Larison.....	Washington, N. J.
Larrowe Milling Co.....	Detroit, Mich.
Lea Milling Co.....	Wilmington, Del.
Frank LeBar .....	Stroudsburg, Pa.
S. Lederer & Son.....	New Brunswick, N. J.
E. K. Lemont & Son.....	Philadelphia, Pa.
C. H. Leonard Co.....	Boonton, N. J.
John C. Liken & Co.....	Sebewaing, Mich.
C. A. Lippincott & Bro.....	Moorestown, N. J.
Listman Mill Co.....	LaCrosse, Wis.
Long Dock Mills.....	Jersey City, N. J.
Edward J. Losaw.....	Wharton, N. J.
George C. Lundy.....	Delaware, N. J.
Lunger Grain and Elevator Co.....	Netcong, N. J.
J. A. Lydecker.....	Paterson, N. J.

## M

J. M. Macdonald.....	Cincinnati, O.
G. G. MacPherson.....	Lebanon, N. J.
F. Maier & Sons.....	South Orange, N. J.
Mann & Allshouse.....	Easton, Pa.
Mann Bros. Co.....	Buffalo, N. Y.
The Manning Co.....	Sussex, N. J.
Mansfield Milling Co.....	Mansfield, O.
A. M. Matthews & Co.....	Orange, N. J.
Maurer Manufacturing Co., Inc.....	Elizabeth, N. J.
Mauser & Cressman.....	Catasauqua, Pa.
Mauser Mill Co.....	Treichlers, Pa.
McMurtrie Milling Co.....	Belvidere, N. J.
Meador-Atlas Co. ....	New York City.
Memphis Cotton Hull and Fiber Co., Ltd.....	Memphis, Tenn.
Merchants' Wholesale Grocery Co.....	Philadelphia, Pa.
Messler & Shannon.....	Blairstown, N. J.
Metropolitan Mills .....	New York City.
Metzger Seed and Oil Co.....	Toledo, O.
Meyer & DeVogel.....	Paterson, N. J.
Midland Linseed Products Co.....	Minneapolis, Minn.
Millbourne Mills .....	Philadelphia, Pa.
H. N. Miller.....	Peapack, N. J.
John H. Miller.....	Rockaway, N. J.
L. F. Miller & Sons.....	Philadelphia, Pa.
V. T. Miller.....	Manasquan, N. J.
Miner-Hillard Milling Co.....	Wilkesbarre, Pa.
C. P. Mohrfeld.....	Collingswood, N. J.
George Q. Moon & Co.....	Binghamton, N. Y.
Moseley & Motley Milling Co.....	Rochester, N. Y.
A. J. Mowerson & Co.....	Wyckoff, N. J.
Mutual Rice Co., Inc.....	New York City.
Mystic Milling and Feed Co.....	Rochester, N. Y.

## N

National Feed Co.....	St. Louis, Mo.
National Oats Co.....	St. Louis, Mo.
Neighbor & Son.....	Califon, N. J.
K. & E. Neumond.....	St. Louis, Mo.
Nischwitz & Son.....	Plainfield, N. J.
Noblesville Milling Co.....	Noblesville, Ind.
J. F. Noll & Co.....	Newark, N. J.
Noll & Fischer.....	Newark, N. J.
Northwestern Consolidated Milling Co.....	Minneapolis, Minn.
Northwestern Elevator and Mill Co.....	Toledo, O.
W. C. Nothern.....	Little Rock, Ark.
Nowak Milling Corporation.....	Buffalo, N. Y.
Jesse H. Nunn.....	Bartley, N. J.

## O

Peter O'Brien .....	Paterson, N. J.
R. J. O'Brien & Bros. Co.....	Passaic, N. J.
Oil Seeds Co.....	New York City.
O. K. Company.....	New York City.
Old Bridge Milling Co.....	Old Bridge, N. J.
Omaha Alfalfa Milling Co.....	Omaha, Neb.
Oradell Flour, Feed and Grain Co.....	Oradell, N. J.
Charles C. Ort.....	Hackettstown, N. J.
Osakis Milling Co.....	Osakis, Minn.

## P

Park & Pollard Co.....	Boston, Mass.
Patent Cereals Co.....	Geneva, N. Y.
Penn Grains and Feed Co.....	Philadelphia, Pa.
M. C. Peters Mill Co.....	Omaha, Neb.
Phelps & Sibley Co.....	Cuba, N. Y.
Philadelphia Seed Co., Inc.....	Philadelphia, Pa.
J. I. Pickens.....	Ridgefield, N. J.
Piel Bros. Starch Co.....	Indianapolis, Ind.
Estate of H. L. Pierson.....	South Orange, N. J.
Pillsbury Flour Mills Co.....	Minneapolis, Minn.
George P. Plant Milling Co.....	St. Louis, Mo.
Prairie State Milling Co.....	Chicago, Ill.
Pratt Food Co.....	Philadelphia, Pa.
Purity Oats Co.....	Davenport, Iowa.

## Q

Quaker City Flour Mills Co.....	Philadelphia, Pa.
Quaker City Manufacturing Co.....	Philadelphia, Pa.
Quaker Oats Co. ....	Chicago, Ill.

## R

Ralston-Purina Co. ....	St. Louis, Mo.
Charles C. Ramey.....	New York City.
M. G. Rankin & Co.....	Milwaukee, Wis.
Red Wing Milling Co.....	Red Wing, Minn.
Reece & Greenly.....	Millville, Pa.

C. A. & T. P. Reed.....	Pennington, N. J.
F. I. Reger.....	Somerville, N. J.
William H. Reger & Son.....	White House Sta., N. J.
Robert A. Reichard.....	Allentown, Pa.
John M. Reuter & Co.....	Elizabeth, N. J.
George Richards Co.....	Dover, N. J.
Ridgway Bros. ....	Pemberton, N. J.
John L. Riegel & Son.....	Riegelsville, N. J.
George B. Robinson, Jr.....	New York City.
A. S. Rockafellow.....	Flemington, N. J.
Rockhill & Fowler.....	Haddonfield, N. J.
D. W. Romaine.....	Jersey City, N. J.
O. W. Roper.....	Vineland, N. J.
Rosekrans-Snyder Co. ....	Philadelphia, Pa.
C. W. Russell.....	New Brunswick, N. J.
Russell-Miller Milling Co.....	Minneapolis, Minn.

## S

Saeger Milling Co.....	Allentown, Pa.
Salem City Milling Co.....	Salem, N. J.
A. P. Sandt.....	Easton, Pa.
William G. Scarlett & Co.....	Baltimore, Md.
S. F. Scattergood & Co.....	Philadelphia, Pa.
Charles Schaefer & Son.....	Brooklyn, N. Y.
W. Schlesinger .....	New Brunswick, N. J.
Nicholas Scholl .....	Newark, N. J.
Scudder & Smith.....	Titusville, N. J.
Isaac Serata & Son.....	Bridgeton, N. J.
Shane Bros. & Wilson Co.....	Minneapolis, Minn.
Shane Bros. & Wilson Co.....	Philadelphia, Pa.
Sharpless & Bro.....	Camden, N. J.
Sheffield-King Milling Co.....	Minneapolis, Minn.
C. M. Sheppard & Co.....	South River, N. J.
H. B. Sherman & Sons.....	Long Branch, N. J.
Sherwin-Williams Co. ....	Cleveland, O.
S. A. Shillinger.....	Stewartsville, N. J.
M. L. Shoemaker & Co., Ltd.....	Philadelphia, Pa.
M. W. Simonson Co.....	Newark, N. J.
Simpson, Hendee & Co.....	New York City.
S. Sindle & Son.....	Little Falls, N. J.
Sitlley & Son, Inc.....	Camden, N. J.
Slater & Jones.....	High Bridge, N. J.
John A. Sloff.....	Pittstown, N. J.
Stephen Smedley .....	Glassboro, N. J.
J. C. Smith & Wallace Co.....	Newark, N. J.
Joseph Smith & Co.....	Stockton, N. J.
Newell N. Smith.....	West Orange, N. J.
Robert M. Smith.....	Sparta, N. J.
W. Newton Smith.....	Baltimore, Md.
C. H. Snyder & Son.....	Freehold, N. J.
Somers & Co.....	San Francisco, Calif.
J. E. Soper Co.....	Boston, Mass.
T. C. Souder & Son.....	Millville, N. J.
Southern Cotton Oil Co.....	Memphis, Tenn.

Sparks Milling Co.....	Alton, Ill.
Spratt's Patent (Am.), Ltd.....	Newark, N. J.
A. E. Staley Mfg. Co.....	Decatur, Ill.
Stamets & Pursel.....	Phillipsburg, N. J.
Stanard-Tilton Milling Co.....	St. Louis, Mo.
Standard Guano Co.....	Baltimore, Md.
John T. Stanley Co., Inc.....	New York City.
Star and Crescent Milling Co.....	Chicago, Ill.
J. & A. Steinberg Co.....	Passaic, N. J.
William H. Stellman.....	Baltimore, Md.
Bernhard Stern & Sons, Inc.....	Milwaukee, Wis.
William N. Steward.....	Englishtown, N. J.
S. A. Stewart.....	Woodbury, N. J.
Zebulon V. Stillwell.....	Villa Park, N. J.
Wilbert Stires .....	Bridgeville, N. J.
Stonaker & Casey.....	Jamesburg, N. J.
The Stone Mill.....	High Bridge, N. J.
I. S. Stover.....	Philadelphia, Pa.
W. Stull & Bro.....	Madison, N. J.
Suffern-Hunt Mills .....	Decatur, Ill.
The Sugarine Co.....	Peoria, Ill.
W. W. Supplee.....	Hampton, N. J.
Swift & Company.....	Newark, N. J.
Syracuse Rendering Co.....	Syracuse, N. Y.

## T

Terhune's Poultry Supply and Feed Co.....	Hackensack, N. J.
Texas Cake and Linter Co.....	Dallas, Texas.
Thatcher & Barnum.....	Hoboken, N. J.
W. & W. E. Thomas.....	Milford, N. J.
A. Thompson & Co.....	Trenton, N. J.
Nelson Thompson & Co.....	Kingston, N. J.
Thompson & Mould.....	Goshen, N. Y.
J. A. Tiger.....	Califon, N. J.
Tioga Mill and Elevator Co.....	Waverly, N. Y.
Toledo Elevator .....	Indianapolis, Ind.
Toledo Grain and Milling Co.....	Toledo, O.
Toledo Seed and Oil Co.....	Toledo, O.
Wright S. Travis.....	New York City.
Trenton Flour Mill Co.....	Trenton, N. J.
Turnersville Roller Mills.....	Turnersville, N. J.
Joseph F. Tuttle.....	Rockaway, N. J.

## U

Ubiko Milling Co.....	Cincinnati, O.
Union Grain Co. ....	Plainfield, N. J.
Union Seed and Fertilizer Co.....	New York City.
United States Sugar Feed Co.....	Milwaukee, Wis.
George Urban Milling Co.....	Buffalo, N. Y.

## V

Valley City Milling Co.....	Grand Rapids, Mich.
A. J. Van Den Berg.....	North Paterson, N. J.
The Van Iderstine Co.....	Long Island City, N. Y.

Frank M. Van Ness.....	Towaco, N. J.
Van Winkle Grain Co.....	Paterson, N. J.
William S. Vroom.....	Somerville, N. J.
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THE MORE IMPORTANT GREENHOUSE INSECTS

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NEW JERSEY

AGRICULTURAL

**Experiment Stations**

296

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NEW JERSEY  
AGRICULTURAL EXPERIMENT STATIONS  
BULLETIN 296

May 31, 1916

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The More Important Greenhouse Insects<sup>1</sup>

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By HARRY B. WEISS

INTRODUCTION

The florists' products of New Jersey amount in a single year to more than \$4,000,000.00. The insect problems incident to this large industry have been both great and pressing. Despite these facts, however, it has not been possible for the Experiment Station to take up the study of even the more important ones. Indeed, such seems to have been the case all over the United States, for but the modicum of attention has anywhere been given to the subject.

In the course of his work as assistant to the State Entomologist the writer has had an excellent opportunity to observe the methods of insect control in practical use and has found them woefully lacking in efficiency. Furthermore, he has found that the florists are working rather too independently in these matters, and that really valuable discoveries of different men have not come into general use.

With a view to sifting the truth from this mass of error and putting it in a form easily available to the florists of New Jersey this bulletin has been prepared, and it is hoped that it may do something to lighten their burdens.

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<sup>1</sup>Contribution from the Department of Entomology, Thomas J. Headlee, Entomologist.

## DESCRIPTION OF INSECTS

The Greenhouse Leaf-tier  
(*Phlyctania rubigalis* Guen.)

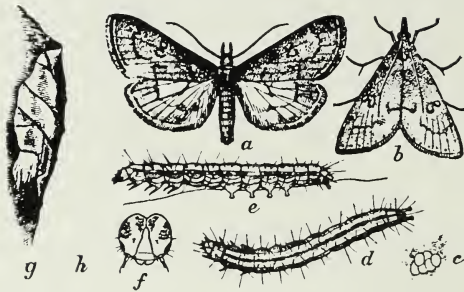


Fig. 1—*Phlyctania rubigalis*: a, moth; b, same in natural position at rest; c, egg mass; d, larva from above; e, same from side; f, head of same; g, pupa case; h, chrysalis; a, b, d, e, g, h, one half larger than natural size; c, twice natural size; f, more enlarged. (After F. H. Chittenden in Bul. 27, U. S. Dept. Agr. Bur. Ent.)

The parent moth is pale, reddish brown, with a wing spread of about  $\frac{3}{4}$  of an inch and can be found during the day under leaves, benches, etc. It readily flies out when the plants are disturbed, and is easily recognized by its triangular form when at rest.

*Injury.*—The injury is accomplished by the larva and consists of a disfigurement of the foliage due to its feeding on especially the lower surface of the leaf. As a rule the larva ties two or more leaves together or folds over the edge of a single leaf. Sometimes the feeding is done in a thin web which is spread over the under surface.

*Food Plants.*—Chrysanthemum is the favorite food, but other recorded food plants are ageratum, geranium, dahlia, carnation, bebonia, violet and rose.

*Life History.*—The moth, which hides during the day beneath benches or on the under sides of the lower leaves or in other places, appears at night and deposits eggs on the under surface of the leaves in groups of from two to fifteen or more. These hatch in ten days or two weeks; the larvæ feed for two or three weeks, and when full grown are about  $\frac{3}{4}$  of an inch long, greenish or greenish-yellow and slightly translucent. Along the back is a median green line, and on each side of this a double white line.

Pupation takes place between the parts of a leaf or two leaves folded together, the moth emerging about a week later.

*Control*.—Spray the under side of the leaves with arsenate of lead as soon as the larvæ appear. Handpicking is also effective.

The Diamond-back Moth  
(*Plutella maculipennis* Curt.)

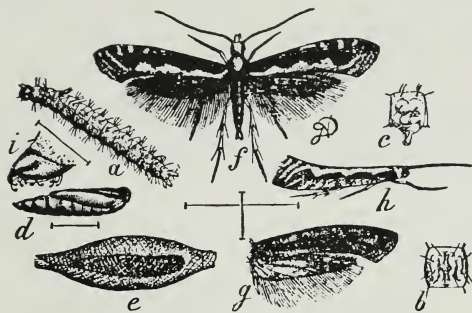


Fig. 2—Diamond-back moth, *Plutella maculipennis*; a, larva; b, one segment of same, more enlarged, as seen from above; c, same, side view; d, pupa; e, pupa in lace like cocoon; f, adult; g, right wings of dark variety of same; h, adult at rest with wings folded; i, tip of pupa. (U. S. Dept. Agr.)

The moth is  $\frac{1}{4}$  of an inch long, with a wing spread of about  $\frac{3}{4}$  of an inch. The wing markings are variable.

*Injury*.—The larvæ feed between the leaf surfaces and on the under sides, causing a riddled condition of the foliage.

*Food Plants*.—Various plants become infested, such as sweet alyssum, stock, wall flower, cabbage and related species.

*Life History*.—The translucent eggs are laid on the upper or the lower leaf surface. They hatch in about five days and the larvæ feed for almost two weeks. These are slender, light green and less than  $\frac{2}{5}$  of an inch in length when full grown, also quite active when disturbed. The pupal period lasts five or six days and takes place in a thin cocoon on the under side of a leaf at the base of the stem or some other concealed place.

*Control*.—Apply arsenate of lead, one pound to 18 gallons of water, to under side of leaves. If plants are in bloom, spray with fresh pyrethrum at the rate of 1 ounce to 2 gallons of water. Do not grow cabbage, cauliflower, rape, turnips, etc., near the houses in which stock or sweet alyssum is to be raised. Keep down all cruciferous weeds around the greenhouses.

The Rose or Oblique-banded Leaf-roller  
(*Archips rosaceana* Harr.)

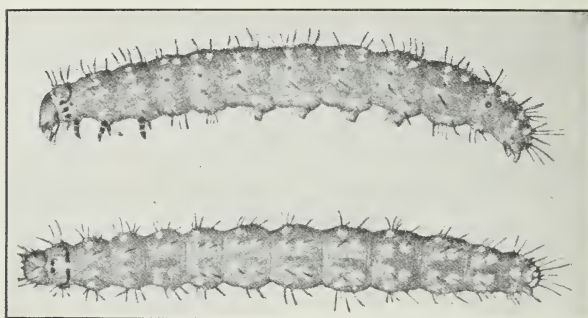


Fig. 3—Rose leaf roller, *Archips rosaceana*, larva, from side and above. Enlarged. (After J. J. Davis.)

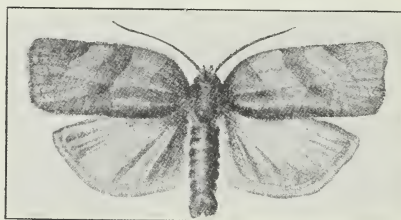


Fig. 4—Rose leaf roller, adult enlarged. (After J. J. Davis.)

The moth is light brownish in color, with a wing spread of from  $\frac{7}{8}$  to  $1\frac{1}{4}$  inches. The fore wings are obliquely crossed with 3 more or less distinct, broad, darker brown bands. The under side of body and wings is yellowish orange.

*Injury.*—The larvæ feed on the leaf tissue and flower buds and conceal themselves by tying several leaves together or folding over a single leaf.

*Food Plants.*—Rose, carnation and various out-of-door plants such as orchard trees and small fruits are likely to become infested.

*Life History.*—Thirty or more yellowish-green eggs are laid in compact masses on the upper leaf surface. They hatch in about two weeks, and the greenish-yellow larvæ feed at first on the leaf tissue and later on the petals and buds. The mature larva, which is from  $\frac{3}{4}$  to  $\frac{7}{8}$  of an inch long and olive green, pupates within a folded leaf or bud, and two or three weeks later the adult moth emerges. This is, of course, active only at night.

*Control.*—Spray with arsenate of lead when the plants are set out. This should be supplemented by handpicking if the foliage is too dense to apply the spray properly.

The Variegated Cutworm  
(*Peridroma margaritosa* Haw.)

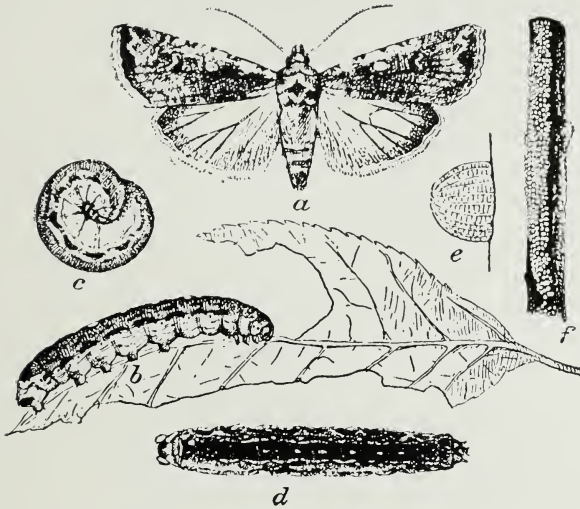


Fig. 5—*Peridroma saucia*; a, moth; b, normal form of larva, lateral view; c, same in curved position; d, dark form, dorsal view; e, egg from side; f, egg mass on twig. (After Howard.)

The caterpillar when full grown is usually dull, blackish brown, mottled with gray, with row of 4 to 6 yellowish spots along middle of back.

*Injury.*—Leaves, stems, flower buds and tender shoots are eaten by these insects.

*Food Plants.*—Various greenhouse plants are injured, especially carnation, chrysanthemum, smilax, sweet pea, asparagus, violet, rose and pansy.

*Life History.*—The parent moth lays from three hundred to five hundred eggs in masses of sixty or more. They hatch in five or six days and the larvæ feed on the leaves and buds. They are active only at night and hide during the day. At the end of twenty-five or thirty days they are full grown and about 1½ inches long. Pupation takes place in the soil, requiring from fifteen to

twenty days, after which the moths appear. These live only a week or ten days, during which time they are active and deposit eggs only at night.

*Control.*—Sod soil likely to contain cut worms should be sterilized before using. According to Mr. J. J. Davis, 1 pound of Paris green to 16 pounds of bran, moistened (not thoroughly wet) gives good results, a small quantity being placed in a pile at the base of alternate plants. Lettuce leaves lightly dusted with Paris green is another poison bait. The Florist's Review states that corn meal mixed with enough Paris green to color it and scattered among infested plants is good. Watering, however, should be avoided six or eight hours before and after applying. Handpicking is sometimes practical in a small house.

The Florida Fern Cut Worm  
(*Eriopus floridensis* Guen.)

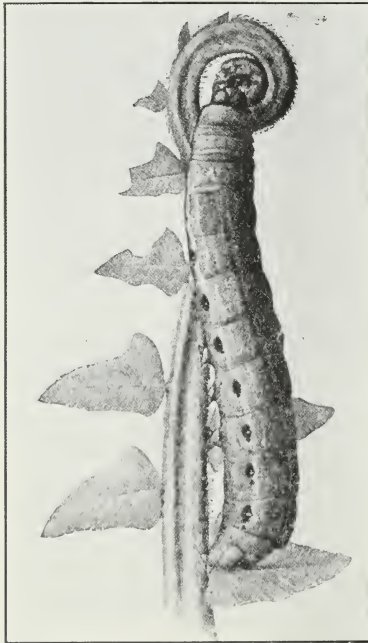


Fig. 6—The Florida fern caterpillar, *Callopietria floridensis*, twice natural size. (After J. J. Davis.)

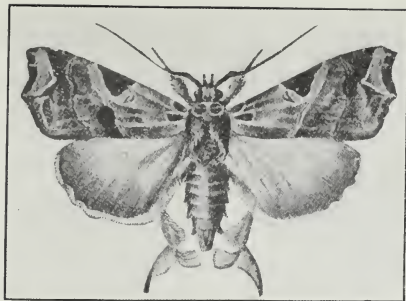


Fig. 7—The Florida fern caterpillar, adult, nearly twice natural size. After J. J. Davis.)

The adult is a rather attractive brownish moth, with variegated wings; length of body, about  $\frac{1}{2}$  inch; wing spread,  $1\frac{1}{8}$  inches. Two forms of caterpillars occur, one a pale green and the other a velvety black.

*Injury.*—The larvæ feed on all portions of the plant, completely stripping it in a few days.

*Food Plants.*—*Adiantum*, *cyrtomium*, *nephrolepis*, *pteris*, *polypodium*, *blechnum* and other varieties of ferns are subject to injury.

*Life History.*—The eggs are laid singly on the under surface of the tips of the leaflets. These hatch in about a week and the young larvæ feed on the tender leaves, usually at night. As they become older they hide during the day, if the house is light, at the base of the plant or in the soil. Two forms of caterpillars occur, one a light green and the other a velvety black. At the end of ten days or two weeks they are full grown and enter the soil to pupate, the moths appearing about twelve or fourteen days later.

*Control.*—Spray with fresh pyrethrum, 1 ounce to 1 gallon of water, plus  $\frac{1}{2}$  ounce of soap. Applications should be made once a week for five or six weeks. It may be necessary, if the caterpillars are numerous, to supplement the spray by handpicking the caterpillars and “swatting” the moths at dusk when they are active.

The Alternanthera Worm  
(*Hymenia perspectalis* Hubn.)



Fig. 8—Alternanthera worm, *Hymenia perspectalis*, length, slightly over one-half inch. (After J. J. Davis.)

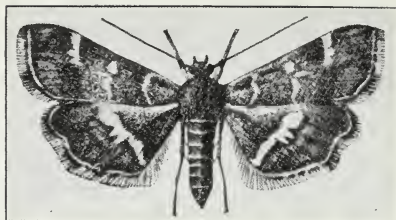


Fig. 9—Alternanthera worm, adult, enlarged. (After J. J. Davis.)

*The full grown larva is about  $\frac{1}{2}$  an inch long, shining green, with rows of small black dots on its back.*

*Injury*—The larvæ feed on the foliage of Alternanthera varieties.

*Food Plants*—Alternanthera varieties.

*Life History*.—The eggs are laid singly on the stem of the plant near its base. Upon hatching the larva first feeds on the under surface of new leaves and later eats the entire leaf. As it becomes larger, it feeds only at night, hiding during the day at the base of the plant. Pupation takes place in a thin loose cocoon found on the wall of the pot or at the base of the plant, an entire life cycle requiring from two to three months.

*Control*.—Spray with arsenate of lead, 1 ounce to 1 gallon of water. Apply it in a fine mist-like condition so as to coat the foliage completely without getting much on the soil. Handpicking is also necessary, especially if the plants are in pots.

#### The Azalea Leaf Caterpillar (*Gracilaria zachrysa* Meyrick.)

Azaleas are sometimes injured by a small, pale green caterpillar which first mines the leaf and later turns over the tip, feeding therein, causing it to turn black and die. Pupation takes place in a slender, whitish cocoon usually attached to the leaf near the injured portion. The adult is a small moth and in severe infestations, the azalea plant presents an unsightly appearance with the tip of every leaf black and dead. This pest was introduced from Europe and as yet has not become widely established.

#### The Water-lily Leaf Cutter (*Nymphula oblitalis* Wlk.)

Water lilies and other aquatic plants are sometimes injured by an aquatic caterpillar which cuts oval pieces out of the leaves and fas-

tens them together forming a flattened, lens-shaped case which protects it as it moves about and feeds on the leaves. This is sometimes quite a serious pest where aquatic plants are raised and is usually gotten rid of by hand picking. The larval cases are readily seen being about three quarters of an inch in length. Sometimes the leaves of the water lilies are sprayed lightly when dry with arsenate of lead. If much force is used, the spray, of course, submerges the leaves and fails to coat them.

Fuller's Rose Beetle  
(*Aramigus fulleri* Horn)

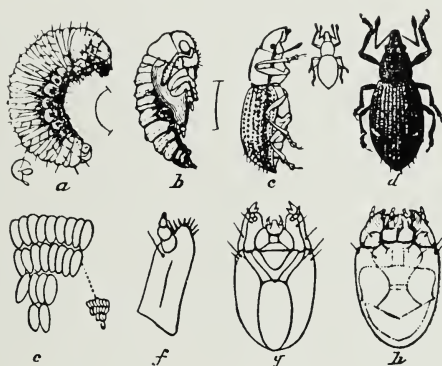


Fig. 10—Fuller's rose beetle, *Aramigus fulleri*; a, larva; b, pupa; c, beetle, side view; d, same, dorsal view; e, eggs enlarged and natural size. (From Riley.)

The brown or gray snout beetle from  $\frac{1}{4}$  to  $\frac{3}{8}$  of an inch long, rests during the day under leaves, clinging motionless to twigs.

*Injury.*—This insect is destructive in both adult and larval stages. The larvæ feed on the roots of their food plants and the beetles attack the foliage, buds and flowers.

*Food Plants.*—Rose, geranium, gardenia, azalea, abutilon, begonia, lily, primrose, camellia, palm and canna, have been known to be attacked.

*Life History.*—Pale yellow eggs  $\frac{1}{20}$  of an inch long are deposited in batches of ten to sixty under loose bark at base of plant, just above the ground. These hatch in one month and the larvæ enter the soil and feed on the roots for from one to three months. Pupation takes place in the ground and the beetles which emerge later are long-lived and hardy. All stages of the insect can be

found during the winter and early spring months. As a rule the beetles feed after dusk and are quiet during the day, resting concealed under leaves and clinging to twigs so as to escape detection. They are sluggish of movement and are unable to fly.

*Control.*—Hand pick and destroy the beetles. A few drops of carbon bisulphide injected here and there about the roots will destroy the larvæ. Tobacco dust applications about the roots are also helpful.

The Rose Midge  
(*Neocerata rhodophaga* Coq.)



Fig. 11—Rose midge, *Neocerata rhodophaga*, female, enlarged and one antenna more enlarged. Length of body one-twentieth of an inch. (After J. J. Davis.)

Fig. 11a—Rose midge, male, length of body, about one twenty-fifth inch. (After J. J. Davis.)

*White maggots within brownish or black flower or leaf buds of rose.*

*Injury.*—The buds become disfigured and deformed, finally turning black and dying.

*Food Plants.*—Roses, such as American Beauty, Uncle John, Killarney, Liberty, Richmond, Meteor, Wooton, Bride, Madame Chatenay, La France and others, have been known to be injured.

*Life History.*—The adult is a small fly or midge which deposits very small, yellowish eggs beneath the sepals of the flower buds or between the folded leaves of the leaf buds. The eggs hatch in a couple of days and the maggots feed inside, sometimes twenty to thirty occurring in a single bud. In a week's time they are full grown, make their way out and drop to the ground in which they pupate, this stage also lasting about one week. From June until November they are most troublesome.

*Control.*—Rotate crops. Plant infested range to some other crop for a year, as the midge is known to attack only roses. If this is not possible it will be necessary to clean the house thoroughly in mid-winter, say in December or January, when the soil insects are dormant. Plants should be destroyed, soil removed from benches and placed some distance from houses. Rubbish beneath benches should be removed and floors and benches sprayed with 20 per cent kerosene emulsion. New soil and new clean plants must take the place of the old. This method has a disadvantage in that the prices of roses are usually highest at the time it must be carried out.

The Chrysanthemum Leaf Miner or Marguerite Fly  
(*Phytomyza chrysanthemi* Kowarz)

*Small, grayish flies about 1/12 of an inch long. Can be seen crawling slowly or resting on plants.*

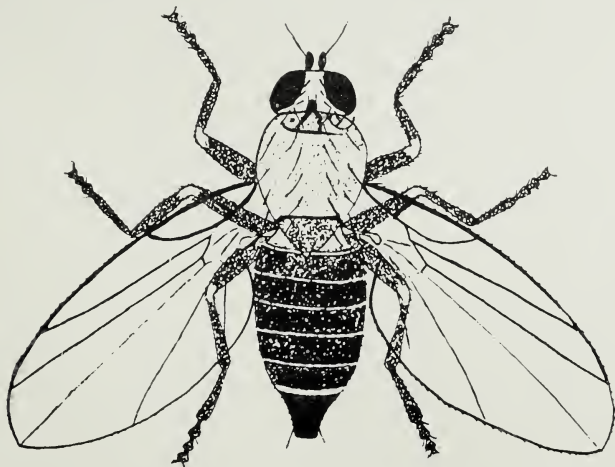


Fig. 12—Dorsal view of adult female marguerite fly, *Phytomyza chrysanthemi*, enlarged. (After M. T. Smulyan.)



Fig. 13—Leaf showing work of larva or maggot. (After M. T. Smulyan.)

*Injury.*—The colorless larvæ mine the leaves, their irregular whitish lines and blotches often taking up an entire leaf surface. In addition to the disfigurement of the foliage, growth is interfered with and the size and the number of flowers are often reduced.

*Food Plants.*—Chrysanthemum, marguerite, and feverfew seem to be the favorite plants. It is also known to attack helianthus, tansy, goldenrod, ragweed, white daisy, dandelion and others.

*Life History.*—Each female deposits from 125 to 150 eggs, every one being laid singly in a slit made by the ovipositor between the skin and flesh of the under surface of the leaf. The eggs hatch within a week and the larvæ feed immediately under the epidermis of the upper surface. At the end of two or three weeks, they are full grown and pupate in the larval mine, the pupal stage lasting about two weeks. The average life cycle is about thirty-three days, the exact length of time depending on the temperature under which the plants are grown.

*Control.*—Apply "Black Leaf 40" diluted from 400 to 450 times in water with the addition of 1 pound of good laundry soap to every

30 gallons, every eleven or twelve days or oftener if the temperature is high. Spray both sides of the leaves, especially the lower one.

The Chrysanthemum Midge  
(*Rhopalomyia hypogaea* H. Lw.)

In the Journal of Economic Entomology Vol. 8, p. 367, Dr. E. P. Felt gives an account of the injury by this insect to chrysanthemums in which he states that the base of the stem was swollen to nearly twice the normal diameter and that swollen masses of tissue occurred in and near the mid-rib of the developing leaves, stopping growth and resulting in a deformed head. The adult is a midge or small fly and inside of the galls or swellings are found the maggots or larvæ. Dr. Felt states that the species is of European origin and that the initial attack is usually confined to buds or tissue just unfolding, including subterranean buds on root stalks. As far as is known, this pest has been found only in Michigan. Cutting and burning of infested parts or plants is evidently the best course to pursue.

The Greenhouse White Fly  
(*Aleyrodes vaporariorum* Westw.)

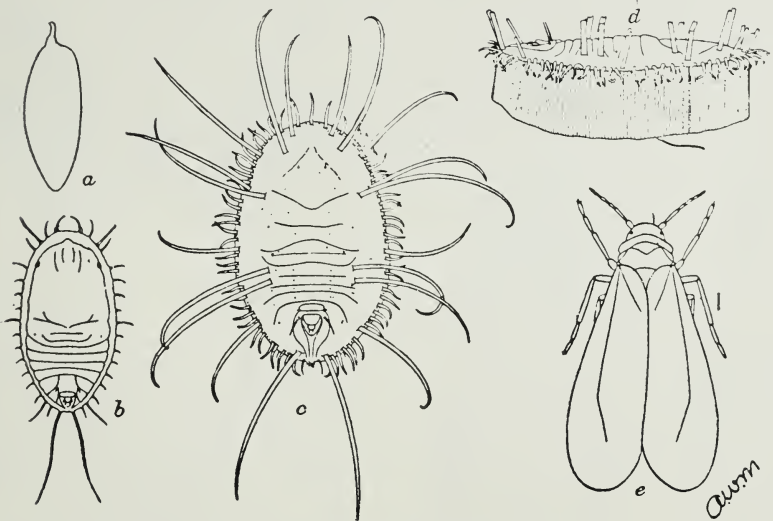


Fig. 14—*Aleyrodes vaporariorum*; a, egg; b, young larva; c, pupa, top view; d, pupa, side view; e, adult. c, d, e, about 25 times natural size; a, b, still more enlarged. (a, d, after Morrill, Tech. Bul. Mass. Agr. Exp. Sta.; e, after Morrill Circ. 57, U. S. Dept. Agr. Bur. Ent.)

*Adults are white winged, yellow bodied insects about 3/50 of an inch in length. The younger stages resembling scale insects.*

*Injury.*—This consists in an abstraction of the sap from the under sides of the leaves by both the nymphs and the adults. If the attack is severe, the leaves dry up and die.

*Food Plants.*—Geranium, tomato, cucumber, melon, lettuce, coleus, primula, rose, eggplant, lantana, fuchsia, salvia, heliotrope, aster and others are all subject to injury by this pest.

*Life History.*—Eggs are attached to the under surface of the leaf and hatch in about two weeks. The nymphs suck the sap from the leaves and in four or five weeks, adults appear, there being many generations in a greenhouse.

*Control.*—Spraying is unsatisfactory because it is hard to reach many of the insects. Tobacco is also unsatisfactory. The best remedy is fumigation with hydrocyanic acid gas. (See directions for fumigation, p. 41.)

The Common Red Spider  
(*Tetranychus telarius* Linn.)

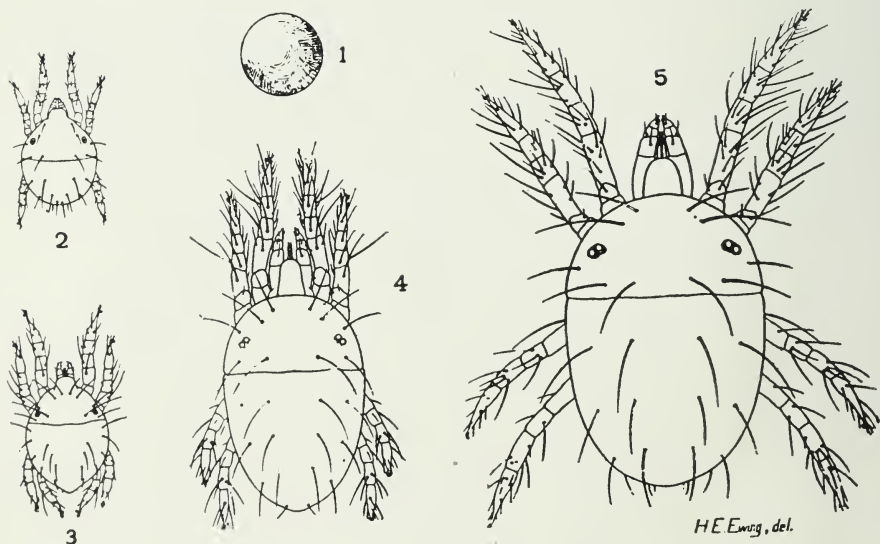


Fig. 15—All stages of greenhouse mite: 1, egg; 2, larva; 3, protonymph; 4, deutonymph; 5, adult. (After Ewing.)

*Small spider like creatures about 1/75 of an inch long are present, with a spotting and discoloration of the foliage.*

*Injury.*—As a rule the injury is confined to the under surface of leaves and consists of an abstraction of sap, leaving small yellowish or white spots. In severe attacks the leaves become dried up and dead.

*Food Plants.*—This mite has a wide range of food plants which includes rose, violet, carnation, clematis, abutilon, fuchsia, bouvardia, verbenas, salvia, phlox, chrysanthemum, smilax, palm, aspidistra, etc.

*Life History.*—From ten to fifty small, spherical, glassy eggs are loosely attached about the webs which the mites spin. These hatch in from three to seven days and the young, pinkish white mites have only three pairs of legs. After the first moult they have four pairs. They moult three times before becoming adults, each stage lasting three or four days. The length of the life of the adult is about three or four weeks, but varies somewhat, depending on the temperature.

*Control.*—Mites resist fumigation with tobacco or hydrocyanic acid gas. Painting sulphur on the pipes is also ineffective. Use kerosene emulsion, 1 to 10 parts of water. Flowers of sulphur 1 ounce to 1 gallon of water alone or combined with soap suds is good. Spray lower sides of leaves. Do not apply with a watering can. Neutral soaps such as ivory, one 5-cent cake to 6 gallons of water can be used. Shave soap fine, dissolve in hot water and add cold water to make 6 gallons. Allow the soap to remain on plants for 2 or 3 hours and then syringe with clear water. The above solution will not kill eggs. Spraying must be repeated until plants are free. Tobacco extracts plus soap are also effective. Prevention is best policy. Use clear water at a pressure of 25 pounds. Wash off the mites and avoid drenching the beds. In winter, do the work on a bright day so that the plants will dry off rapidly. Wet the walks etc., so that the house does not become too dry. A dry atmosphere and a high temperature will promote the development of the mites.

The Cattleya Fly  
(*Isosoma orchidearum* Westw.)

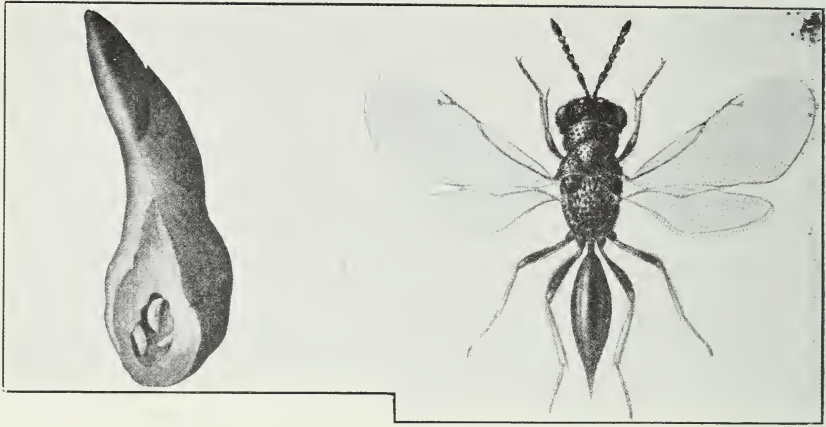


Fig. 16—Orchid bud injured by larvæ of "Cattleya Fly," *Isosoma orchidearum*. (After J. J. Davis.)

Fig. 17—"Cattleya Fly," adult, length about  $\frac{1}{7}$  of an inch. (After J. J. Davis.)

*Swollen buds containing small white maggots.*

*Injury.*—The infested bulbs become swollen, hollowed out inside and fail to produce flowers.

*Food Plants.*—Orchids of the genus *Cattleya* are subject to attack.

*Life History.*—The adults are small, clear winged, black bodied wasp-like insects. The female has a long ovipositor, by means of which the eggs are deposited, in the centre of the small flower bulb near the base. From one to eight larvæ are found in one bulb and their feeding produces a cavity in the centre, which, of course, destroys the embryo flower bud.

*Control.*—Fumigation once a week with nicotine extracts is recommended to kill the adults. This must be done while they are emerging and is an uncertain practice. Besides, it sometimes injures the flowers. The practice of cutting and destroying the infested bulbs once a week will, if adhered to regularly, give considerable freedom. This must be done by an experienced man, otherwise many good bulbs will be destroyed.

The Orchid Root Borer  
(*Castnia therapon* Koll.)

*Large pinkish white larva boring in rhizome.*

*Injury.*—The roots and bulbs are hollowed out and destroyed.

*Food Plants.*—*Oncidium crispum*, *catasetum* sp. and *Cattleya labiata*, are at present the only recorded food plants.

*Life History.*—The large pinkish white larva bores through the rhizome and up into the bulb. The adult is a rather large showy moth and a native of Brazil.

*Control.*—Destroy infested parts of the plant.

The Orchid Bulb Borer  
(*Eucactophagus graphipterus* Champ.)

*White, grub-like larva in bulb.*

*Injury.*—This larva destroys the interior of the bulb and paves the way for decay.

*Food Plants.*—*Lycaste*, *Odontoglossum* and various other species having large soft bulbs have been found to contain this pest.

*Life History.*—The adult is a large weevil having a light band on its back. The larva excavates a large cavity in the bulb destroying much of the interior. Pupation takes place inside of the bulb and the adults feed on leaves and other portions of the plant. Infested bulbs can be detected by pressing slightly with thumb and forefinger upon which the tissue over the cavity gives in.

*Control.*—Destroy infested bulbs.

The Cattleya Midge  
(*Parallelodiplosis cattleya* Moll.)

*Yellowish maggot in swelling near the tip of root.*

*Injury.*—The injury consists in a reduction of the vitality of the plant.

*Food Plants.*—*Cattleya* spp. and other orchids have been found infested.

*Life History.*—The larvæ of this midge live as yellowish maggots in an unsightly gall or swelling near the tips of the roots.

*Control.*—Destruction of infested roots should be practiced. Do not introduce infested orchids in a house that is free of them.

The Greenhouse Thrips  
(*Heliothrips hæmorrhoidalis* Bouché)



Fig. 18—Greenhouse thrips, *Heliothrips hæmorrhoidalis*, adult female, enlarged about 50 diameters. Greatly enlarged antenna beneath. (After H. M. Russell in Circ. 151 U. S. Dept. Agr. Bur. Ent.)

*Very dark small brown active insects about 1/24 of an inch long.*

*Injury.*—The adults and larvæ puncture the epidermis, lacerate the tissue and suck out the juices and vegetable matter. Injured leaves become full of tiny pale spots. As the attack continues, these unite and become blotches. Leaves become limp, yellow and finally drop off.

*Food Plants.*—This insect has a wide range of food plants such as rose, azalea, carnation, palm, rubber plant, fuchsia, croton, aspidistra, dahlia, phlox, verbena and others.

*Life History.*—Eggs are laid in the leaf tissue and hatch in eight days. The larvæ feed in colonies from ten to twenty days, depending on the temperature, and the pupal stage lasts from four to six days, there being many generations in a greenhouse.

*Control.*—Fumigate with fresh, standard nicotine papers using about 2 sheets for every 1000 cubic feet of space. Do the work at night in a moist atmosphere and air thoroughly the next morning.

Liquid extracts of nicotine as fumigants are used at the rate of 1 ounce of 40 per cent extract to every 1000 cubic feet of space. The material is evaporated over small lamps or stoves and to prevent scorching should be diluted with 2 parts of water to 1 part of the material. The fumigation should be done at night in tightly closed houses. Syringing will keep the insects down slightly. Spraying with nicotine extracts and kerosene emulsion will kill large numbers but many of them feed in concealed places and are not hit. A formula which many rose growers in New Jersey have used during the past several years, consists of a mixture of Paris green, sugar and water. The horticulturist of the New Jersey Agricultural Experiment Station, according to his 1914 report, tried out various mixtures along these lines and found that the application to American Beauty Roses of 3 pounds white sugar, from 1 to 2 tablespoonfuls of Paris green and 12 quarts of water gave no serious burning. The mixture is applied as a spray. Do not use molasses or brown sugar, as injury to foliage may result. All treatments should be repeated in seven to ten days, sometimes a third one being necessary.

### Plant Lice

*Small greenish, brown or black sucking insects found on under side of leaves and around tender shoots.*

*Injury.*—Aphids are equipped with sucking mouth parts and their continued drain upon the sap supply weakens and stunts the growth of the plant and disfigures the foliage.

*Food Plants.*—Various species of the plant lice are found in greenhouses, such as *Aphis gossypii* Glover on cucumber, althaea, Easter Lily, *Aphis hederæ* Kalt on English Ivy, *Aphis nerii* Fonsc on oleander, *Aphis rufomaculata* Wils. (green) and *Macrosiphum sanborni* Gill. (black) on chrysanthemum, *Rhopalosiphum violæ* Pergande on the violet, *Macrosiphum rosæ* and *Myzus rosarum* Kalt on the rose and *Myzus persicæ* Sulz. on carnation, asparagus, fern and primula.

*Life History.*—Plant lice have an exceedingly complicated life history. For general purposes it is sufficient only to know that living young are born the greater part of the year, that winged and wingless females are developed, the former being responsible in the

majority of cases for the spread of the species from plant to plant. Reproduction is rapid, each female giving birth to one or two dozen young in a short time. Young shoots, flower buds and the under side of leaves are attacked.

*Control*.—Fumigate with tobacco extracts or papers. Cut blooms first. Make house tight and have atmosphere moist. Number of papers depends on tightness of house. Papers are hung up and lighted. Fumigate at night or on a cloudy day, never in bright sunlight. Syringe the plants thoroughly after fumigation. Two or three applications are sometimes necessary. Spraying with nicotine extracts and soap is also recommended. (See directions for fumigation, p. 41.)

### Mealy Bugs

(*Pseudococcus citri* & *P. longispinus*)

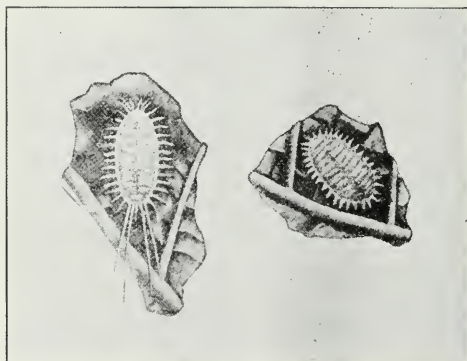


Fig. 19—Mealy bugs: at left, *Pseudococcus longispinus*; at right, *P. citri*. (After Comstock.)

*Scalelike, oval, elongate insects 1/12 to 1/8 of an inch long covered with white mealy powder.*

*Injury*.—These insects suck the juices, causing loss of color, followed by wilting and death of infested parts.

*Food Plants*.—They are found on many greenhouse plants such as the bay tree, palm, rubber plant, coleus, geranium, etc.

*Life History*.—Two species are found in greenhouses, their life history being practically the same. The female lays from 300 to 500 eggs in a mass beneath the tip of the abdomen and covers it with white waxy filaments. Egg laying continues for a week or ten days,

twenty to thirty eggs being laid every twenty-four hours. They hatch in two weeks and the larvæ resemble the adults except that their bodies are not covered at first with wax. Insects of all sizes can be found on the plant at the same time, mostly on the under side of the leaves, along the ribs and veins and in crevices between the stem and leaves. The males are small winged insects, which are rarely seen.

*Control.*—Fumigate with tobacco extracts or paper. (See remedy for Aphis.) Dip the infested plants in Aphine at the rate of 1 part to 20 of water.

### The Kentia Mealy Bug (*Pseudococcus pseudonipæ* Ckll.)

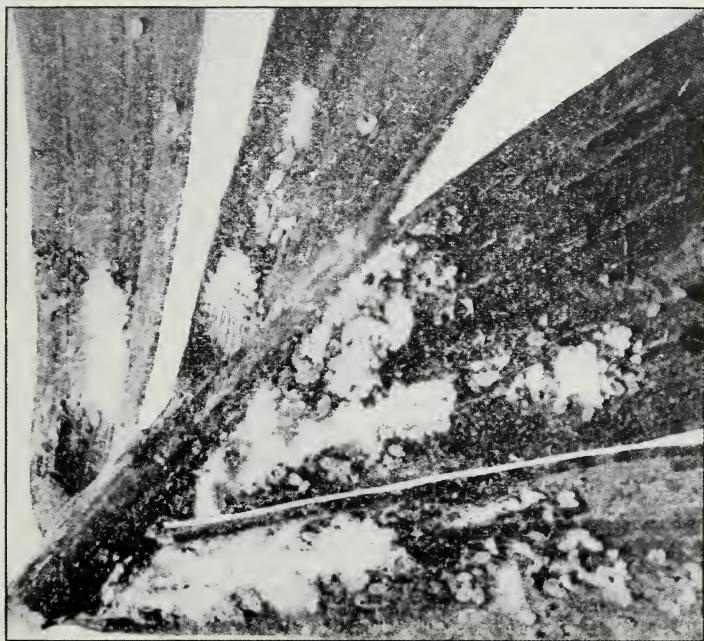


Fig 20—Kentia mealy bug, *Pseudococcus pseudonipæ* Ckll. on under side of palm leaf. (After E. O. Essig.)

*General Appearance.*—This mealy bug can be distinguished from others by the cream colored wax which is arranged on the body segments in rows of small patches and by the 7-jointed antennae.

*Food Plants.*—This is a serious pest at times on palms of the species *Kentia* and *Cocos*. It collects in large masses on the under surface of the leaves, weakening the plant and making it unsightly and unsalable.

*Control.*—Scrub off by hand, using weak soap solutions.

The Greenhouse Orthezia  
(*Orthezia insignis* Dougl.)

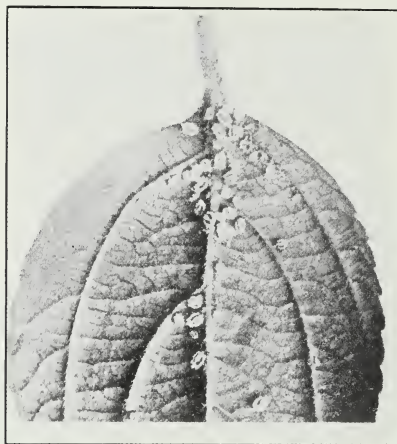


Fig. 21.—The greenhouse Orthezia on Lantana leaf. Twice natural size.  
(After W. E. Britton.)

*General Appearance.*—These insects are similar to mealy bugs and crawl about during all stages. Their bodies are covered with plates of a white waxy secretion. There are several generations a year. The eggs are carried in a white egg sac fastened to the body of the female at its posterior end. As the young grow their bodies become covered with wax and when full grown are completely hidden.

*Food Plants.*—*Coleus*, *amaranthus*, *chrysanthemum*, *lantana*, *verbena*, *gardenia*, *salvia*, etc., are all likely to become infested.

*Control.*—See remedy for mealy bugs.

The Soft Brown Scale  
(*Coccus hesperidum* Linn.)



Fig. 22—Soft brown scale, *Coccus hesperidum* Linn., on orange twig. (After Essig, P. C. Jr. Ent)

*General Appearance.*—This is a flat, oval, soft scale varying from almost colorless to dark brown and sometimes black. When full grown, it is almost  $\frac{1}{4}$  of an inch in length. The young are born alive, moult twice and come to maturity and produce young in about 65 days. Copious amounts of honey dew are excreted by these scales, and as a result the black fungus which grows on the honey dew is always present.

*Food Plants.*—The bay tree, croton, palm, begonia, cyclamen, fern,

citrus plants, calla lily, rose, oleander, camellia and many others are subject to this scale.

*Control.*—See Scale Insect Remedies, p. 38.

The Black Scale  
(*Saissetia olea* Bern)

*General Appearance.*—This scale is quite large and convex with a prominent ridge down the middle of the back and two transverse ridges, the three forming a distinct letter H. In color it is a dark brown to almost black. The female lays from 1500 to 2000 eggs over a period of two months. These hatch in fifteen to twenty days and the adult female is full grown in from eight to ten months. The eggs are laid under the body of the female which gradually becomes hollow until it is simply a hemisphere full of eggs. This scale does not lose the power of locomotion until late in life and it feeds on both leaves and stems.

*Food Plants.*—Recorded food plants are citrus, palm, oleander, rubber plant, *Cycas revoluta*, stag horn fern and others.

*Control.*—See Scale Insect Remedies, p. 38.

The Hemispherical Scale  
(*Saissetia hemisphaerica* Targ)



Fig. 23—Hemispherical scale on fern. (After W. E. Britton.)

*General Appearance.*—This is easily distinguished from the black scale, by its smooth shiny surface, light brown color and absence of the ridges forming the letter H. From 500 to 1000 eggs are deposited beneath the body of the female and the young settle along the mid ribs and veins. They remain here for four to six weeks and then migrate to the stems and stay there permanently. Sometimes the insects are found on the edges of the leaves. A full life cycle requires from five to six months.

*Food Plants.*—Fern, croton, citrus plants, palm, orchid, alternanthera, oleander, abutilon and many others.

*Control.*—See Scale Insect Remedies, p. 38.

The Pineapple Scale  
(*Diaspis bromelicæ* Kern.)

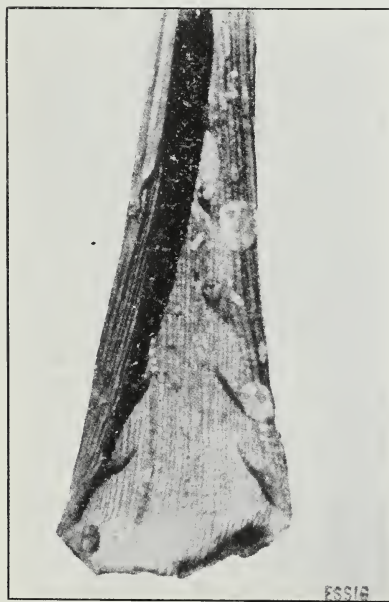


Fig. 24—Pineapple scale, *Diaspis bromelicæ* Kern. (After E. O. Essig.)

*General Appearance.*—The female scale coverings are thin, circular and almost pure white in color, with exuviae yellow. The females burrow into the leaves and become almost hidden.

*Food Plants.*—Pineapple, sago palm, *Olea fragrans*, canna, etc.

*Control.*—See Scale Insect Remedies, p. 38.

## The Circular Scale

(*Chrysomphalus aonidum* Linn.)



Fig. 25—Circular scale, *Chrysomphalus aonidum* on rubber plant. (After W. E. Britton.)

*General Appearance.*—Mature female scale covering is circular, convex, quite large, with a nipple like protuberance in the centre which is grayish and surrounded by a reddish brown ring. Male scale covering is smaller and slightly elongate. Both sexes are dark in color, almost black. Each female lays about 200 eggs.

*Food Plants.*—This scale is common on plants having fleshy leaves, rubber plant, palm, oleander, citrus plants, *Olea fragrans*, cycads, panadanus, camellia, etc.

*Control.*—See Scale Insect Remedies, p. 38.

## Morgan's Scale

(*Chrysomphalus dictyospermi* Marg.)

*General Appearance.*—This is similar to *C. aonidum* but flatter and lighter in color. Females give birth to living young.

*Food Plants.*—This scale is sometimes quite a serious pest on palms and it occurs also on cycas, latania, etc.

*Control.*—See Scale Insect Remedies, p. 38.

Cottony Cushion Scale  
(*Icerya purchasi* Mask.)



Fig. 26—Cottony cushion scale, *Icerya purchasi* Mask on orange twig. (Cal. Hort. Com.)

*General Appearance.*—The adults are easily recognized by the large, white, fluted cottony masses and red or yellowish bodies ranging from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch long. From 400 to 1000 eggs are concealed in the cottony masses.

*Food Plants.*—All citrus trees, acacia, rose, geranium, verbenas and other greenhouse plants are subject to attack.

*Control.*—See Scale Insect Remedies, p. 38.

The Fern Scale  
(*Hemichionaspis aspidistra* Sign.)

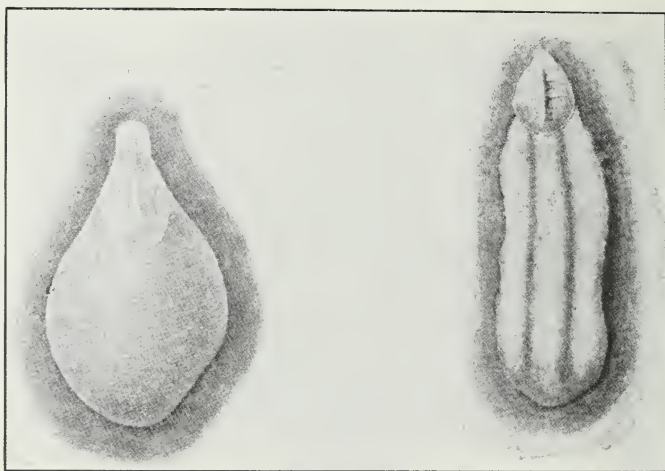


Fig. 27—Fern scale, *Hemichionaspis aspidistra*, female scale greatly enlarged. After J. J. Davis.)

Fig. 28—Fern scale, male scale, greatly enlarged. (After J. J. Davis.)

*General Appearance.*—Female scale covering is somewhat oval, yellowish brown in color and about 1/16 of an inch in length. The white elongate males are more conspicuous and occur in greater numbers.

*Food Plants.*—Commonly found on aspidistra, fern, orchid, and pandanus, etc. On ferns it is usually found on both sides of the leaves at the base of the clump.

*Control.*—See Scale Insect Remedies, p. 38.

The Greedy Scale  
(*Aspidiotus rapax* Comst.)

*General Appearance.*—The female scale covering is very convex, of a grayish white color, sometimes tinged with yellow, due to the showing through of the body of the insect. The exuvia is a dark, almost black spot, surrounded by a white ring and is slightly to one side of the centre. Eggs are laid by the female and the young usually settle in colonies on the trunk and branches. There are several generations a year in a greenhouse.

*Food Plants.*—Laurus, orange, fuchsia, lemon, camellia, fig, salvia, acacia, ivy.

*Control.*—See Scale Insect Remedies, p. 38.

The Oleander Scale  
(*Aspidiotus hederae* Vall.)

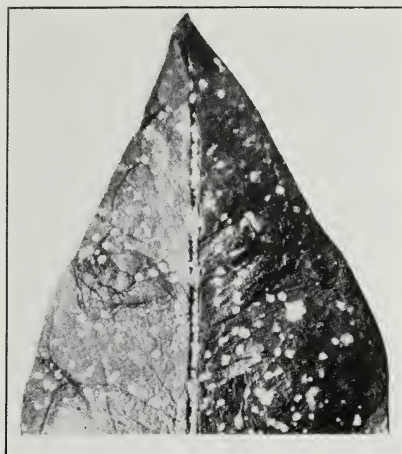


Fig. 29—White or orleander scale, *Aspidiotus hederae* on Croton leaf. (After W. E. Britton.)

*General Appearance.*—This is a common greenhouse species, the covering of the female being circular, nearly white, slightly convex, with a pale orange spot in the centre or slightly to one side. The male scale is white, slightly elongate, with a central light yellow exuvia. The eggs which are light yellow are deposited under the female scale and hatch in a few hours, the young later settling on the leaves and stems. From seventy to eighty days are required for development from egg to adult.

*Food Plants.*—Bay tree, oleander, orchid, citrus plants, cycad, palm, acacia, ivy, cyclamen and many others.

*Control.*—See Scale Insect Remedies, p. 38.

The Red or Orange Scale  
(*Chrysomphalus aurantii* Mask.)

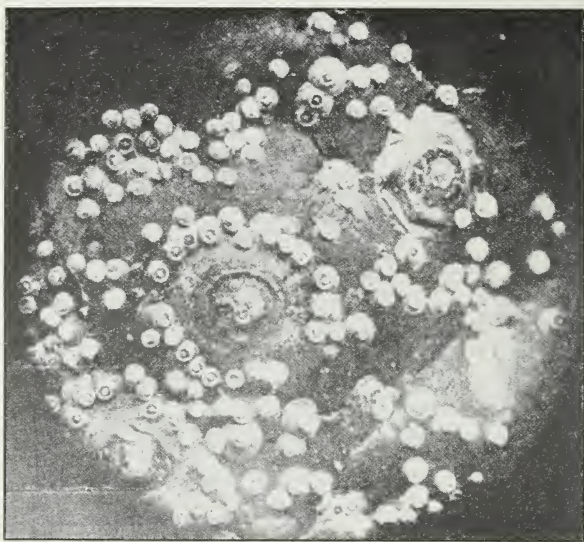


Fig. 30—Red scale, *Chrysomphalus aurantii* Mask, mature females and young.  
(Bul. 222 Cal. Agr. Exp. Sta.)

*General Appearance.*—This scale is circular and flat, from  $1/16$  to  $1/8$  of an inch in diameter. The scale covering is thin and allows the red body of the female to show through. The male scales are smaller, elongated and of a grayish or dark brown color. Young are born alive and remain under the parent scale for several days. Two and one-half months are necessary before they become mature.

*Food Plants.*—Citrus plants, palm, acacia, fig and others are attacked.

*Control.*—See Scale Insect Remedies, P. 38.

The Chaff Scale  
(*Parlatoria pergandii* Comst.)

*General Appearance.*—These are small circular, elongated irregular scales dirty gray in color with the exuvia or cast skin at one end. The male scale is long and narrow. Both the larvæ and eggs are purplish in color. The life cycle requires from six weeks to two months. This species is quite prolific, but does not spread rapidly. It is found mainly on the trunk and branches although occasionally on the leaves.

*Food Plants.*—As a rule citrus plants only are attacked.

*Control.*—See Scale Insect Remedies, p. 38.

Nematode Gallworms or Eelworms  
(*Heterodera radiculicola* Mull.)



Fig. 31—Gall worm eggs and young worms just hatched, taken from potato. (Illustration from microphotograph, after F. B. Headley.)

*The presence of these worms is indicated by galls or swellings on the roots.*

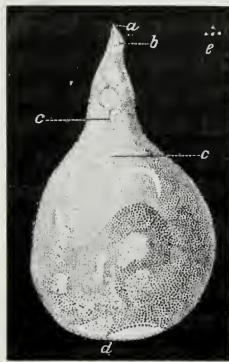


Fig. 32—Female of gall worm, *Heterodera radiculicola*, magnified 85 diameters. (After N. A. Cobb.)



Fig. 33—Primrose roots badly infested with the gallworm. (After N. A. Cobb.)



Fig. 34—Chrysanthemum, the roots of which are infested with gallworm. (After N. A. Cobb.)

*Injury.*—The first symptoms above ground are a checking of the growth, foliage becoming light green in color, not thrifty. The leaves curl and the plant eventually wilts and dies.

*Food Plants*—Eelworms are distributed everywhere in greenhouses. They attack numerous shade, fruit and ornamental trees and plants. The foliage is sometimes attacked, the infestation showing as brownish irregularly circular blotches.

*Life History.*—Eelworms are not insects but microscopic transparent and semi-transparent creatures shaped like minute eels and much lower in the animal scale than insects. They are present everywhere in the soil and many forms live on decaying matter. They are less than  $1/25$  of an inch in length and each female deposits from 400 to 500 eggs. The worms enter the growing tips of the roots and work in, forming galls or swellings. The small, recently hatched worms make their way to the exterior of the roots and seek new roots in the soil.

*Control.*—Employ fresh soil every year. Infested soil can be treated with commercial formaldehyde, 2 parts to 100 parts of water. If frames are shallow  $1\frac{1}{2}$  gallons is enough for every

square yard. Stir the soil after the treatment so that all parts will be disinfected. The excess of formalin should be allowed to escape before plants are set out.

It seems probable, however, that soil bacteria might be killed by this method. Steam sterilization is recommended as the best method where possible. The use of carbon bisulphide as against white grubs is suggested. Have clean plants to start with. Eelworms thrive best in a moist atmosphere.

### Foliar Eelworms

Eelworms or nematodes have been found infesting the leaves of begonia, chrysanthemum, coleus, bouvardia, lantana, salvia, zinnia, pelargonium, moonflower and fern. Brownish, more or less circular blotches appear on the leaves of infested plants. These gradually enlarge, becoming irregular in outline, until the leaves curl and finally drop off. It is supposed that the eelworms are present in the soil and probably crawl up the stems of plants when the latter are small and at a time when the stems are moist. Another theory is that they are splashed upon the plants during syringing. Preventive measures can only be suggested, such as steam sterilization of the soil and the use of clean plants to begin with.

### The Carnation Bud-Rot and the Mite Accompanying It

Early in the fall carnation buds may become deformed and fail to open. If on cutting them open a decayed interior is found, together with several glistening egg-like bodies, then the trouble is due to a mite (*Pediculopsis graminum* Reuter) and the carnation bud-rot. The egg-like globules are female mites with greatly distended bodies. The rot is caused by a species of fungus *Sporotrichum poae*, which also causes the silver top of June grass, and the mite has been found accompanying the disease in both cases.

It appears that the mites bearing the disease spores are carried into the house during the summer in the soil and enter the immature flower buds as soon as they appear. The spores therefore find a favorable place in which to develop, and decay finally sets in. The trouble usually starts early in the fall and the injury becomes abundant the latter part of October or first of November. Lawson is the most commonly affected variety. Pink and red varieties are only slightly infested. Where the blossoms

are regularly picked, the injury disappears by January. Treatment consists in promptly picking and burning all infested buds.

### White Grubs

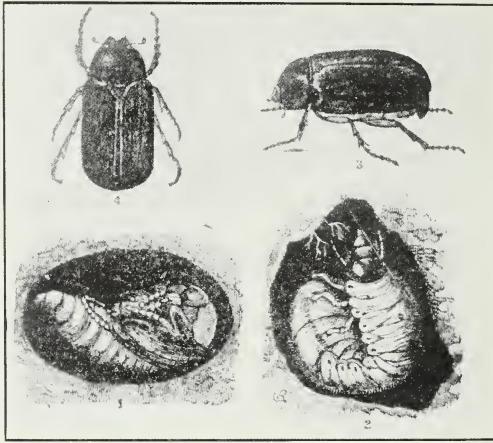


Fig. 35—May beetle: 1, pupa in earthen cell; 2, larva or white grub; 3, 4, beetle, from side and above.

These larvæ of May beetles or “June Bugs” are sometimes introduced into greenhouses in the soil taken from composted sod piles, and are capable of doing considerable damage by feeding on the roots of various plants. Before introducing manure and compost into the house, it is well to examine the material for these larvæ. If they are present, they can be readily killed after the soil is in the benches and before anything has been planted by treatment with carbon bisulphide. This consists in punching holes in the soil with a stick and introducing into each 1 ounce of carbon bisulphide, which amount is sufficient for 1 square foot. Just before treatment, which should be given at a temperature of about 70° F, the soil should be wetted thoroughly. Before planting, the soil should be turned over and allowed to aerate.

*Caution.*—All lights and fires should be kept away while carbon bisulphide is being used.

### Sow Bugs

(Crustacea)

*Dark gray, oval flat-bodied creatures, moving rapidly when exposed to light.*

*Injury.*—These have been known to feed on roots and tender portions of plants, such as fronds of ferns.

*Life History.*—These creatures are commonly found under decaying boards, rotten bark and other dark situations where decay is taking place. They are not insects but land crustaceans.

*Control.*—Trap by means of little heaps of wet grass or leaves or pieces of damp bark. Examine in the morning and destroy those found. The Florist's Review gives the following remedy—"Mix 2 parts of rye flour, 2 parts of sugar and 1 part of Paris green. Scatter mixture along top of edge board of greenhouse bed or on narrow board laths across the soil in the frame or hotbed. The board must be dry or the mixture will become too lumpy for the sow bugs to eat. Mix only enough to use at one time, as it cakes and deteriorates after standing." A liberal use of tobacco dust will also undoubtedly discourage them.

### Slugs and Snails

(*Mollusca*)

*Slimy, dark, often spotted or striped creatures from ½ of an inch to 3 or 4 inches long.*

*Injury.*—The injury consists in a destruction of the foliage.

*Food.*—Various greenhouse plants are attacked by these creatures.

*Life History.*—Cellar slugs, field slugs, garden slugs and snails are usually classed together by the florist as snails or slugs. Their bodies are covered with a slimy secretion which sticks to whatever they crawl over, leaving a glistening trail behind.

*Control.*—Camphor balls scattered about are said to be effective. Tobacco dust, ashes, soot, etc., if scattered about the pots so that the slugs will be compelled to cross them to get to the plants will act as barriers, or coming in contact with their slimy bodies, will kill them.

### Millipedes

(*Myriopoda*)

*Worm-like, hard-shelled creatures having 2 pairs of legs on each segment except the first three.*

*Injury.*—They occasionally attack roots and stems of various plants.

*Food Plants.*—Normally they feed on decaying vegetable matter.

*Life History.*—They are usually found in damp places such as under flower pots, etc.

*Control.*—Manure containing a large amount of decaying vegetable matter usually contains millipedes. Soot will discourage them. Pieces of potato dipped in Paris green and covered over night with a cabbage leaf is also recommended.

### Centipedes

(*Myriapoda*)

*Rapidly moving creatures, flat, hard, elongate bodies; each segment bears a single pair of legs.*

*Injury.*—These are not injurious to greenhouse plants.

*Food plants.*—They are predaceous and feed on insects.

*Life History.*—They usually live under stones, logs, bark and under pots in greenhouses.

*Control.*—Not necessary.

### SCALE INSECT REMEDIES

Many scale insects are more or less permanently established in some greenhouses and are a constant source of annoyance and expense. Practically all of them are difficult to control successfully, and most of the insecticides recommended for greenhouse use against the scale insects are ineffective. Many of them will kill scale larvæ, but here their usefulness ends. Other have been recommended on the strength of too little experimentation, usually of a meagre kind, which neglected to recognize the part played by atmospheric conditions and other variable factors which affect the results. This is especially true of many fumigation experiments, which have been conducted in a small box with a few plants and the results given out as regular prescribed remedies. As a result of this condition, the most effective work in combating scale insects in greenhouses is done when the plants are overhauled and repotted. At this time badly infested plants are destroyed, and many scales gotten rid of by scrubbing the leaves. In other words, laborious hand methods are still the fashion in many greenhouses, not from choice but from necessity. The changing population of some houses by selling and replenishing often aids the greenhouse man considerably, as in this way an infestation often has not a chance to become serious. Spraying or dipping with

whale oil soap or tobacco extracts or a combination of both is effective in killing recently set scales and scale larvæ, but ineffective against the adult scales. Inasmuch as it is often impossible to spray many greenhouse plants thoroughly, dipping is to be preferred. However, this method has disadvantages, such as the length of time required and the impossibility of killing those insects in cracks and crevices, protected by layers of air which prevent the solution from reaching them. Syringing with clear water undoubtedly washes many larvæ from the plants onto the bench, where they eventually die, and also dislodges many of the larger soft scales. However, where the pressure is weak the syringing is by no means very effective against insects. Precautionary measures also should be considered. This means that scale-infested plants should not be introduced into a house free of them. If it is necessary to buy such infested plants, scrub them clean before placing them on the benches. The writer is aware of the successful use of hydrocyanic acid gas in California against certain scales which infest citrus plants, but it would be hardly suitable to advise the use of this gas against the same scales in greenhouses until it has been tried.

#### GREENHOUSE FUMIGATION

Inasmuch as greenhouses differ considerably in tightness and construction, and as past experimentors have in many cases failed to note moisture and temperature conditions, the subject of greenhouse fumigation is in a somewhat unsettled state, and such a condition will continue to prevail until some one makes a serious and long-continued study of the subject, taking into consideration all factors which have a bearing on the result.

Concerning the amount of potassium cyanide to use against the white fly, A. W. Morrill, in Circular 57 of the Bureau of Entomology, U.S. Department of Agriculture, states that between  $\frac{1}{5}$  and  $\frac{1}{6}$  of an ounce per 1000 cubic feet of space for 3 hours' exposure has been used with success, also that  $\frac{1}{3}$  of an ounce per 1000 cubic feet of space used for more than 30 minutes destroyed only the adults and slightly injured the plants (tomato and cucumber), and that in one instance 1 ounce per 1000 cubic feet of space gave good results in an all-night exposure. He also states that probably  $\frac{1}{4}$  of an ounce of cyanide for each 1000 cubic feet for an exposure not exceeding 3 hours represents the amount which will prove most

effective for treatment without injury to tomato or cucumber. R. D. Whitemarsh, in Circular 154 of the Ohio Agricultural Experiment Station, states that in general the amount of cyanide necessary for white fly work varies from  $\frac{1}{5}$  to  $\frac{1}{6}$  of an ounce per 1000 cubic feet for 3 hours to 1 ounce per 1000 cubic feet lasting overnight, depending on the construction of the greenhouse. He further states that it is well to have the temperature as low as 55 if possible for best results, and that the fumigation should be repeated in 2 weeks. Mr. J. J. Davis, in the 27th Report of the State Entomologist of Illinois, advises for white fly in moderately tight houses, 1 ounce of cyanide to 3500 cubic feet of space for an all-night exposure, the operation to be repeated 3 or 4 times at intervals of 10 days to 2 weeks. In his general fumigation directions he advises that if possible a temperature above 60° to 65° F should be avoided, since at a higher one the plants are more liable to be injured.

A. B. Gahan, in Bulletin 119 of the Maryland Agricultural Experiment Station, states that in houses containing a number of different kinds of plants he would recommend the use of not more than  $\frac{3}{4}$  of an ounce of cyanide for each 1000 cubic feet of space. This charge, he says, will be sure to kill thrips, aphids and white fly if left in a closed house over night, the following plants being uninjured by such an exposure—violet, primula, chrysanthemum, begonia, nasturtium, alternanthera, lantana, verbena, orchid, snapdragon, asparagus fern, sweet pea, coriopsis, mignonette, carnation, croton, cyclamen, Easter lily, geranium, rose, cucumber and lettuce. He further states that a long exposure to a moderate amount of gas is less likely to cause injury to most plants than a short exposure to a heavy charge.

Our experience in New Jersey with white fly on tomatoes leads us to advise for a modern tight greenhouse  $\frac{5}{8}$  of an ounce to 1000 cubic feet of space for an exposure of 20 or 25 minutes, having the temperature from 60° to 70° F, and the humidity 70 per cent.

Prof. M. A. Blake, in the New Jersey Agricultural Experiment Station Report for 1913, tells of the successful results obtained against the rose aphid in a tight, well-glazed greenhouse, using  $\frac{5}{8}$  of an ounce of cyanide to 1000 cubic feet for an exposure of 16 minutes with the temperature above 65° F, and where moisture conditions were normal for a rose house. From a series of tests conducted at the New Jersey Stations, he remarks that fumigations

against the rose aphid are not likely to be successful where the temperature of the house is 60° F or below, inasmuch as metabolism in insects is largely determined by temperature, and when this is low the insects resist the effects of the cyanide. The tenderness of the plants should also be considered. The more tender and soft the growth the more likely injury will follow the use of cyanide.

W. J. Schoene, in Technical Bulletin No. 30 of the New York State Agricultural Experiment Station, in a series of fumigation tests with brown-tail moth caterpillar, found that a greater number of caterpillars survived the fumigations made at a low temperature than at a higher temperature, also that fumigations made under humid conditions were more destructive to the larvæ than tests conducted in dry air. He suggests that the difference in the results and the resistance of the larvae to fumigation were due largely to the conditions incidental to hibernation, such as the reduced moisture content and comparative inactivity of the larvæ.

Taking into consideration the work of Mr. Schoene and our own experience in fumigation, we cannot at present help but be advocates of heavy charges of cyanide and short exposure. However, as has been stated before, the entire subject needs a thorough investigation from all angles.

#### DIRECTIONS FOR FUMIGATING WITH HYDROCYANIC ACID GAS

Fumigate only at night. Have the foliage of the plants dry. The materials used in the generation of the gas are 98 per cent. potassium cyanide, commercial sulphuric acid and water. For every ounce of cyanide use 2 fluid ounces of sulphuric acid and 4 fluid ounces of water.

1st—Determine accurately the number of cubic feet of space in the greenhouse to be fumigated.

2nd—Find out the total amounts of cyanide and sulphuric acid necessary, and divide these into parts or charges representing each 25 feet of length of the greenhouse.

3rd—Weigh out the desired amounts of pulverized cyanide for each charge and wrap each in a single thickness of cheesecloth or place in a thin paper bag.

4th—Measure out the necessary amounts of sulphuric acid and water and place in glazed earthenware dishes or glass receptacles (do not use metal). Pour the water in first and add the acid

slowly, mixing with a glass rod or stick. The container should never be more than  $\frac{1}{4}$  full of acid and water, because the action which follows the introduction of the cyanide will result in much of the material being splashed out. Ordinary glass tumblers or bowls, 6 or 8 inches high, about 3 or 4 inches wide, are often suitable.

5th—Make the house as tight as possible by closing all ventilators and stopping up all cracks.

6th—Distribute the bowls containing the acid and water at the desired distance apart and place beside each the bag of cyanide.

7th—Commence at the far end of the greenhouse and work toward the exit, dropping each bag of cyanide gently into the bowl. If a number of charges are necessary, two or more operators will need to work together. After the last bag has been disposed of, leave the greenhouse immediately and close and lock the door.

8th—After the fumigation has gone on the desired length of time, thoroughly air the house for at least  $\frac{1}{2}$  an hour before entering.

9th—Take out the containers, keeping face averted so as not to breathe the odor which comes from them, and bury the contents in the ground.

10th—Wash out the containers with clear water and use for no other purpose. As soon as the cyanide comes in contact with the acid and water the gas starts to come off, and by using many containers or generators a quicker distribution of the gas is assured.

*Caution.*—Potassium cyanide is a deadly poison when taken internally, and the gas generated by the addition of cyanide to sulphuric acid is also a deadly poison when inhaled. As a result, one should use extreme care in handling these materials. With proper precautions and care there is no danger. No matter how familiar one is with fumigation, it will not pay to become careless.

ANALYSES OF COMMERCIAL FERTILIZERS, FERTILIZER SUPPLIES AND  
HOME MIXTURES.

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NEW JERSEY

AGRICULTURAL

**Experiment Stations**

297

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# NEW JERSEY

## AGRICULTURAL EXPERIMENT STATIONS

### BULLETIN NO. 297

September 16, 1916

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#### **Analyses of Commercial Fertilizers, Fertilizer Supplies and Home Mixtures**

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By

CHARLES S. CATHCART, *State Chemist*.\*

A portion of the brands of fertilizers that were collected during the season of 1916 has been examined, and the results obtained are herewith reported. The analyses of the remaining brands and a discussion of the entire inspection will be given in a later bulletin.

The results that are tabulated on the following pages show the composition of 408 brands of mixed fertilizers, 188 samples of fertilizer materials and 13 home mixtures. In addition to the above the analyses of 26 duplicate samples of mixed fertilizers are included. The total number of analyses reported in this bulletin is 635.

#### **Valuations**

The usual conference of the directors and chemists of the experiment stations of the New England States and New Jersey was held. The question of valuations for the present year was carefully considered. It was the unanimous opinion that, on account of the great fluctuations in the prices of the various materials used, no schedule could be prepared which would fairly represent the charges to be made during the season.

On account of this condition no valuations have been computed either for the fertilizer materials or for the mixed fertilizers.

#### **Examinations of Unmixed Fertilizer Materials**

The samples of fertilizer materials that are herewith reported represent the various classes of materials that are usually offered for sale, with the exception of the ground bones which will be reported in a later bulletin.

*Nitrate of Soda.* Thirty-two samples of nitrate of soda were ex-

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\*The analyses were made by Ralph L. Willis, Frank O. Fitts, Louis J. Kleinfeld, D. James Kay and Archie C. Wark.

aminated, and the results obtained, omitting samples Nos. 16605 and 16976, varied from 14.68 to 15.64 per cent nitrogen, with an average of 15.30 per cent. This average is equivalent to 92.9 per cent of nitrate of soda. The shipments represented by samples Nos. 16605 and 16976 were not accompanied by the required guarantee, and it will be noted that the nitrogen content was 11.59 and 11.18 per cent, respectively.

*Sulphate of Ammonia.* - Six samples were received and the results obtained varied from 19.88 to 20.63 per cent of nitrogen, the average being 20.32 per cent.

*Dried Blood.* Seven samples were examined and the results, omitting sample No. 16329, varied from 10.49 to 13.94 per cent in nitrogen and from 0.30 to 5.24 per cent in phosphoric acid. The averages are 12.33 per cent of nitrogen and 1.7 per cent of phosphoric acid. Sample No. 16329 is omitted from the averages on account of the deficiency in the nitrogen content.

*Dried and Ground Fish.* The results of the examination of the 20 samples show the variations usually found with this class of material. The nitrogen content varied from 5.43 to 9.35, with an average of 8.02 per cent. The phosphoric acid content varied from 1.09 to 10.01, with an average of 6.00 per cent.

*Crude Fish.* The average analysis of the four samples is: nitrogen, 3.52 per cent, and phosphoric acid, 6.91 per cent.

*Tankage.* Fifty-six samples were examined, one of which, sample No. 160054, is not included in the averages. The nitrogen content of the 55 samples varied from 4.02 to 8.90, with an average of 6.11 per cent. The phosphoric acid varied from 1.56 to 17.89, with an average of 9.96 per cent. The mechanical condition was as variable as the content of nitrogen and phosphoric acid. Seventy per cent of the finest sample was finer than 1/50 inch, while only 12 per cent of the coarsest sample would pass through a sieve of the same size.

*Acid Phosphate.* Fifty-six samples of acid phosphate were examined, of which 22 were guaranteed 16 per cent, 31 were guaranteed 14 per cent, one was guaranteed 15 per cent and two were guaranteed 12 per cent. The average samples of the various grades fully satisfied the guarantees given with the exception of the 12 per cent grade.

*Basic Lime Phosphate.* Two samples were examined, one of which was 1.72 per cent deficient in available phosphoric acid while the second sample satisfied the guarantee.

## NITRATE OF SODA.

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	NITROGEN.	
		Found.	Guaranteed.
	American Agricultural Chemical Co., New York City.		
16327	J. Inlincci, Waterford, N. J. ....	15.39	15.00
	Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.		
16747	J. S. Collins & Sons, Inc., Moorestown, N. J. ....	15.29	14.81
16935	A. Heuser, Matawan, N. J. ....	15.39	14.81
	J. H. Baird & Son, Marlboro, N. J.		
16072	J. H. Baird & Son, Marlboro, N. J. ....	15.57	14.84
	Baugh & Sons Co., Philadelphia, Pa.		
16490	William Wilde, Vineland, N. J. ....	15.45	15.23
	Farmers' Co-operative Association, Trenton, N. J.		
16824	H. W. Bozarth, White House, N. J. ....	15.03	.....
	Godfrey Co-operative Fertilizer and Chemical Co., Newark, N. J.		
16808	H. B. Kemp, Long Branch, N. J. ....	15.40	14.81
160121	H. Sigle, Rhode Hall, N. J. ....	15.40	14.81
	Hendrickson & Dilatush, Robbinsville, N. J.		
16817	J. R. Hulsart, Belmar, N. J. ....	15.40	.....
	H. H. Hutchinson, Jr., Robbinsville, N. J.		
160055	H. H. Hutchinson, Jr., Robbinsville, N. J. ....	15.23	15.50
	Keystone Bone Fertilizer Co., Philadelphia, Pa.		
16351	F. S. Maise, Elm, N. J. ....	15.35	14.50
	S. Lederer & Son, New Brunswick, N. J.		
16794	S. Lederer & Son, New Brunswick, N. J. ....	15.38	.....
	Monmouth County Farmers' Exchange, Freehold, N. J.		
16099	Monmouth County Farmers' Exchange, Freehold, N. J. ....	15.32	14.80
	Nitrate Agencies Co., New York City.		
16492	James Neilson, New Brunswick, N. J. ....	15.26	15.00
16873	A. P. Woolley, Matawan, N. J. ....	15.36	15.00
	J. F. Noll & Co., Inc., Newark, N. J.		
160564	J. F. Noll & Co., Inc., Newark, N. J. ....	15.19	15.00
	Reading Bone Fertilizer Co., Reading, Pa.		
16915	L. Yerkes, Lewistown, N. J. ....	14.91	15.00
	F. S. Royster Guano Co., Baltimore, Md.		
16432	M. Feinstein, Bridgeton, N. J. ....	15.26	15.00
	Ruckman Bros., New Brunswick, N. J.		
160482	Ruckman Bros., New Brunswick, N. J. ....	15.39	15.00
	Scott Fertilizer Co., Elkton, Md.		
16204	J. Hendrickson, Mt. Ephraim, N. J. ....	15.45	.....
	Standard Guano Co., Baltimore, Md.		
16605	*Charles Earl, Millville, N. J. ....	11.59	.....
16976	*W. W. Twaddell, Lumberton, N. J. ....	11.18	.....

\* Not included in the average.

## NITRATE OF SODA—(Continued).

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	NITROGEN.	
		Found.	Guaranteed.
	Swift & Co., Baltimore, Md.		
16992	B. D. Wolcott's Sons, Eatontown, N. J.....	15.42	14.82
	Swift & Co., Kearny, N. J.		
16756	College Farm, New Brunswick, N. J.....	15.34	.....
	Geo. F. Taylor Com. Co., New York City.		
16938	C. C. Hulsart, Matawan, N. J.....	15.12	.....
	I. P. Thomas & Son Co., Philadelphia, Pa.		
16110	T. B. Cross, Delanco, N. J.....	15.64	15.00
16541	Training School, Vineland, N. J.....	15.34	15.00
	Trenton Bone Fertilizer Co., Trenton, N. J.		
16959	T. S. Borden, Beverly, N. J.....	15.39	15.58
	F. W. Tunnell & Co., Inc., Philadelphia, Pa.		
16140	D. H. Kirkpatrick, Jamesburg, N. J.....	15.07	14.81
	Union Chemical Works, North Wales, Pa.		
16549	Allivine Farms, Norma, N. J.....	14.68	15.50
	West Jersey Marl and Trans. Co., Woodbury, N. J.		
16165	West Jersey Marl and Trans. Co., Quinton, N. J.....	15.26	15.23
	Woodward & Dickerson, Philadelphia, Pa.		
16188	J. Wenderoth & Son, Camden, N. J.....	15.39	14.82
	Average .....	15.30	.....

## NITRATE OF SODA (15 Per Cent).

	F. W. Tunnell & Co., Inc., Philadelphia, Pa.		
16206	Elmer Iszard, Sewell, N. J.....	11.18	12.34

## SULPHATE OF AMMONIA.

	H. H. Hutchinson, Jr., Robbinsville, N. J.		
160056	H. H. Hutchinson, Jr., Robbinsville, N. J.....	20.31	20.63
	Monmouth County Farmers' Exchange, Freehold, N. J.		
160088	Monmouth County Farmers' Exchange, Freehold, N. J.....	20.31	20.50
	Swift & Co., Kearny, N. J.		
16760	College Farm, New Brunswick, N. J.....	19.88	.....
	Geo. F. Taylor Com. Co., New York City.		
16867	L. D. Roberts, Keyport, N. J.....	20.51	.....
	I. P. Thomas & Son Co., Philadelphia, Pa.		
16540	Training School, Vineland, N. J.....	20.63	20.59
	W. Wilde, Vineland, N. J.		
16543	W. Wilde, Vineland, N. J.....	20.25	20.50
	Average .....	20.32	.....

**DRIED BLOOD.**

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	NITROGEN.		PHOSPHORIC ACID.	
		Found.	Guaranteed.	Found.	Guaranteed.
	American Agricultural Chemical Co., New York City.				
16329	J. Inlincci, Waterford, N. J.....	*8.89	9.87	*5.67	.....
	J. H. Baird & Son, Marlboro, N. J.				
16073	J. H. Baird & Son, Marlboro, N. J.....	13.17	13.33	0.66	.....
	Baugh & Sons Co., Philadelphia, Pa.				
16711	C. Dammann, Egg Harbor, N. J.....	10.49	9.88	5.24	.....
	Martin Fertilizer Co., Philadelphia, Pa.				
16387	Charles A. Crowley, Blue Anchor, N. J.....	11.67	9.88	1.38	.....
16722	John Sampson, Winslow, N. J.....	11.42	9.88	2.13	.....
	Nitrate Agencies Co., New York City.				
16494	James Neilson, New Brunswick, N. J.....	13.94	13.16	0.30	.....
	I. P. Thomas & Son Co., Philadelphia, Pa.				
16939	C. C. Hulsart, Matawan, N. J.....	13.29	13.43	0.47	.....
	Average .....	12.33	.....	1.70	.....

\* Not included in the average.

**DRIED AND GROUND FISH.**

	Acme Guano Co., Baltimore, Md.				
16197	Z. Patterson, Mt. Ephraim, N. J.....	5.43	.....	8.02	.....
	American Agricultural Chemical Co., New York City.				
16328	J. Inlincci, Waterford, N. J.....	8.16	8.25	7.02	6.00
	Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.				
16145	J. S. Collins & Son, Inc., Moorestown, N. J.....	9.30	9.46	7.76	7.78
	Baugh & Sons Co., Philadelphia, Pa.				
16474	J. B. Eastlack, Thorofare, N. J.....	8.42	8.23	5.58	6.87
16710	Germania Fruit Growers' Union, Cologne, N. J.....	7.66	8.23	5.12	6.87
	Keystone Bone Fertilizer Co., Philadelphia, Pa.				
16349	F. S. Maiese, Elm, N. J.....	7.15	6.50	5.42	3.00
	Martin Fertilizer Co., Philadelphia, Pa.				
16389	J. Heggan, Blue Anchor, N. J.....	8.23	8.23	9.88	10.00
16725	John Sampson, Winslow, N. J.....	8.40	.....	10.01	.....
	Elwood Roberts Co., Philadelphia, Pa.				
16344	Ellwood Roberts Co., Winslow Junction, N. J.....	7.32	.....	5.55	.....
	F. S. Royster Guano Co., Baltimore, Md.				
16902	H. V. Vreeland, Matawan, N. J.....	8.81	8.23	7.77	5.00
	South Jersey Farmers' Exchange, Woodstown, N. J.				
16136	South Jersey Farmers' Exchange, Woodstown, N. J.....	9.00	8.86	6.48	6.00
	Standard Guano Co., Baltimore, Md.				
16171	Fogg & Hires, Salem, N. J.....	7.41	.....	6.15	.....
16241	Theo. Schubert, Mt. Ephraim, N. J.....	7.44	.....	6.47	.....

**DRIED AND GROUND FISH—(Continued).**

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	NITROGEN.		PHOSPHORIC ACID.	
		Found.	Guaranteed.	Found.	Guaranteed.
16471	I. P. Thomas & Son Co., Philadelphia, Pa. J. Carter, Thorofare, N. J.....	8.90	9.04	6.41	.....
16957	Trenton Bone Fertilizer Co., Trenton, N. J. T. S. Borden, Beverly, N. J.....	9.35	8.20	1.32	.....
160149	Bennett & Bennett, Prospect Plains, N. J..... F. W. Tunnell & Co., Inc., Philadelphia, Pa.	8.68	8.20	1.09	.....
16883	W. H. Kirkbride, Medford, N. J.....	8.03	8.23	3.71	.....
160031	H. C. Adams, Edgewater Park, N. J..... West Jersey Marl and Trans. Co., Woodbury, N. J	7.24	6.58	5.57	.....
16239	J. Marple, Blackwood, N. J.....	7.77	8.23	5.32	6.87
16601	G. M. Weatherby, Swedesboro, N. J..... Average .....	7.85	8.23	5.32	6.87
		8.02	.....	6.00	.....

**CRUDE FISH.**

16420	Keystone Bone Fertilizer Co., Philadelphia, Pa. F. Fennimore, Riverside, N. J.....	3.16	4.00	7.14	3.00
16665	F. W. Tunnell & Co., Inc., Philadelphia, Pa. H. V. Ross, Bridgeport, N. J.....	3.39	3.71	6.85	6.00
16700	R. W. Jaggard, Blackwood, N. J.....	3.97	3.71	6.72	6.00
16886	C. H. Stokes, Medford, N. J..... Average .....	3.55	3.71	6.92	6.00
		3.52	.....	6.91	.....

**FISH AND BONE.**

16885	F. W. Tunnell & Co., Inc., Philadelphia, Pa. E. J. Haines, Atsion, N. J.....	3.33	4.94	19.48	12.00
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**FISH MIXTURE.**

16729	Ellwood Roberts Co., Philadelphia, Pa. Ellwood Roberts Co., Winslow Junction, N. J.....	4.94	4.10	7.05	.....
16668	Scott Fertilizer Co., Elkton, Md. *B. Robbins, Swedesboro, N. J.....	10.25	8.73	3.28	5.34
16237	F. W. Tunnell & Co., Inc., Philadelphia, Pa. P. H. Peters, Blackwood, N. J..... Average .....	3.55	3.71	7.23	6.00
		4.25	.....	7.14	.....

\* 2.65% nitrogen in form of ammonia salts. Not included in the average.

## TANKAGE.

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	MECHANICAL ANALYSIS.				PHOSPHORIC ACID.	
		Finer than 1/50 inch.	Coarser than 1/50 inch.	Found.	Guaranteed.	Found.	Guaranteed.
16235	Acme Guano Co., Baltimore, Md. B. Casner, Blackwood, N. J.....	35	65	6.61	.....	1.56	.....
16984	American Agri. Chemical Co., New York City G. Roberts, New Monmouth, N. J..... Armour Fertilizer Works, Baltimore Md., and Chrome, N. J.	50	50	7.47	7.41	9.77	9.15
16421	F. Fennimore, Riverside, N. J.....	47	53	6.52	6.58	9.35	9.17
16861	J. H. Haines & Son, Medford, N. J..... J. H. Baird & Son, Marlboro, N. J.	53	47	7.11	7.40	8.08	6.87
16075	J. H. Baird & Son, Marlboro, N. J..... Baugh & Sons Co., Philadelphia, Pa.	16	84	7.93	8.18	5.80	.....
16109	G. A. Cranmer, Fish House, N. J.....	62	38	7.13	.....	8.17	.....
16411	W. J. Gaventa, Repaupo, N. J.....	44	56	4.74	4.94	7.49	3.00
16473	J. B. Eastlake, Thorofare, N. J.....	56	44	6.67	6.58	11.20	4.00
16600	T. W. Hendrickson, Swedesboro, N. J...	35	65	4.99	4.94	6.02	3.00
16918	J. R. Moore, Swedesboro, N. J..... J. R. Beckett, Swedesboro, N. J.	45	55	5.59	4.94	10.04	3.00
16557	S. Butler, Swedesboro, N. J.....	70	30	5.07	4.94	14.65	10.00
16599	G. M. Weatherby, Swedesboro, N. J..... The Berg Co., Philadelphia, Pa.	54	46	4.62	4.94	13.40	10.00
160443	P. S. Yetter, Belvidere, N. J..... L. H. Chambers, Mt. Holly, N. J.	50	50	4.02	4.53	15.51	.....
16967	L. H. Chambers, Mt. Holly, N. J..... Coe-Mortimer Co., New York City.	41	59	7.58	.....	8.65	.....
16408	W. J. Gaventa, Repaupo, N. J..... J. W. Dunham, Alloway, N. J.	44	56	4.97	.....	15.75	.....
16011	Geo. B. Thrasher, Cape May Ct. House, N. J. Godfrey Co-operative Fert. & Chemical Co., Newark, N. J.	20	80	5.69	.....	11.00	.....
160116	H. Sigle, Rhode Hall, N. J.....	45	55	6.73	7.40	7.97	6.90
160117	H. Sigle, Rhode Hall, N. J..... Hendrickson & Dilatush, Robbinsville, N. J.	37	63	4.54	4.93	12.72	13.74
16816	J. R. Hulsart, Belmar, N. J..... H. H. Hutchinson, Jr., Robbinsville, N. J.	27	73	8.43	8.23	6.17	.....
160054	*H. H. Hutchinson, Jr., Robbinsville, N. J.	26	74	2.31	2.47	1.38	.....
160057	H. H. Hutchinson, Jr., Robbinsville, N. J. B. Lieber, Atlantic City, N. J.	50	50	7.25	6.58	8.32	.....
16024	B. Lieber, Atlantic City, N. J.....	12	88	4.49	.....	17.18	.....
16025	B. Lieber, Atlantic City, N. J..... Locke & Black, Swedesboro, N. J.	..	..	4.04	.....	17.89	.....
16417	J. H. Brown, Swedesboro, N. J..... Martin Fertilizer Co., Philadelphia, Pa.	52	48	5.60	.....	12.51	.....
16358	D. L. Ballinger, Moorestown, N. J.....	50	50	5.88	.....	12.77	.....
16385	C. A. Crowley, Blue Anchor, N. J.....	57	43	6.40	6.54	11.37	10.00

\* Not included in the average.

## TANKAGE—(Continued).

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	MECHANICAL ANALYSIS.				PHOSPHORIC ACID.	
		Finer than 1/50 inch	Coarser than 1/50 inch.	Found.	Guaranteed.	Found.	Guaranteed.
	Martin Fertilizer Co., Phila., Pa.—(Cont.)						
16621	G. A. Rode, Swedesboro, N. J.....	55	45	4.81	4.94	9.02	10.00
16622	G. A. Rode, Swedesboro, N. J.....	50	50	6.32	6.54	8.28	10.00
16724	J. Sampson, Winslow, N. J.....	61	39	6.57	6.54	10.23	10.00
16854	A. Haines, Masonville, N. J.....	50	50	6.38	6.54	10.91	10.00
	Monmouth Co. Farmers' Exc., Freehold, N. J.						
16098	Monm'h Co. Farmers' Ex., Freehold, N. J.	52	48	7.00	5.75	9.04	9.00
16778	J. Ketchum, Farmingdale, N. J.....	51	49	6.23	.....	10.28	.....
	New Jersey Fert. & Chem. Co., Jersey City, N. J.						
16866	L. D. Roberts, Keyport, N. J.....	52	48	5.87	7.40	5.69	9.16
	Nitrate Agencies Co., New York City.						
16493	James Neilson, New Brunswick, N. J.....	43	57	6.34	5.75	6.55	6.86
	Philadelpha Guano Works, Philadelphia, Pa.						
160213	Voorhees & Dunham, Bound Brook, N. J.	40	60	6.08	4.94	9.50	.....
	Reading Bone Fertilizer Co., Reading, Pa.						
16614	J. E. Gaventa, Pedricktown, N. J.....	46	54	5.51	5.75	11.28	9.00
	Ellwood Roberts Co., Philadelphia, Pa.						
16730	Ellwood Roberts Co., Winslow, N. J.....	40	60	4.13	4.92	7.32	9.00
	F. S. Royster Guano Co., Baltimore, Md.						
16901	H. V. Vreeland, Matawan, N. J.....	66	34	8.51	7.40	9.82	9.20
	Scott Fertilizer Co., Elkton, Md.						
16205	J. Hendrickson, Mt. Ephraim, N. J.....	38	62	5.26	4.94	11.91	9.16
	Harry L. Sickie, Woodbury, N. J.						
16480	Cassidy Bros., Thorofare, N. J.....	53	47	5.56	.....	12.02	.....
	South Jersey Farmers' Ex., Woodstown, N. J.						
16137	So. Jersey Farmers' Ex., Woodstown, N. J.	57	43	5.93	.....	16.76	.....
16306	So. Jersey Farmers' Ex., Woodstown, N. J.	52	48	3.66	.....	2.91	.....
	Swift & Co., Kearny, N. J.						
16874	H. B. Kemp, Long Branch, N. J.....	40	60	4.85	4.94	11.51	12.00
160341	A. Hoffman, Mendham, N. J.....	31	69	7.09	7.41	7.47	6.00
160487	College Farm, New Brunswick, N. J.....	47	53	8.34	7.41	6.35	6.00
	I. P. Thomas & Son Co., Philadelphia, Pa.						
16478	S. S. Budd, Thorofare, N. J.....	44	56	5.84	5.75	14.18	9.00
16658	W. H. Parkhurst, Hammonton, N. J.....	35	65	6.78	7.40	10.38	9.00
16689	W. H. Parkhurst, Hammonton, N. J.....	47	53	5.82	5.75	15.60	.....
	F. W. Tunnell & Co., Inc., Philadelphia, Pa.						
16207	E. Iszard, Sewell, N. J.....	45	55	4.06	.....	10.08	.....
160309	A. R. Quimby, Mendham, N. J.....	41	59	4.61	4.94	5.01	13.00
160609	H. C. Adams, Edgewater Park, N. J.....	45	55	6.56	4.94	9.48	13.00
	Union Chemical Works, North Wales, Pa.						
16550	Allivine Farms, Norma, N. J.....	54	46	7.83	8.20	9.80	6.86
	West Jersey Marl and Trans. Co., Woodbury, N. J.						
16214	J. Boden, Glassboro, N. J.....	41	59	6.70	5.76	7.67	5.00
16426	Cassidy Bros., Thorofare, N. J.....	45	55	5.70	5.76	6.04	5.00
	W. Wilde, Vineland, N. J.						
16544	W. Wilde, Vineland, N. J.....	57	43	6.31	6.53	12.14	5.00
	Woodward & Dickerson, Philadelphia, Pa.						
16186	J. Wenderoth & Son, Camden, N. J.....	37	63	8.90	9.06	6.66	6.87
	Average .....	..	..	6.11	.....	9.96	.....

## 16 PER CENT ACID PHOSPHATE.

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	PHOSPHORIC ACID.					
		Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total.	Available.	
						Found.	Guaranteed.
16292	American Agri. Chemical Co., New York City. F. Sleeter, Laurel Springs, N. J.....	11.12	4.60	1.66	17.38	15.72	16.00
	Baugh & Sons Co., Philadelphia, Pa.						
16612	Troth & Keen, Millville, N. J.....	14.80	1.39	1.31	17.50	16.19	16.00
16713	Germania Fruit Growers' Union, Cologne, N. J. ....	14.70	2.20	1.25	18.15	16.90	16.00
160185	Belle Mead Farmers' Club, Belle Mead, N. J. ....	13.46	2.40	0.55	16.41	15.86	16.00
	Coe-Mortimer Co., New York City.						
16409	W. J. Gaventa, Repaupo, N. J.....	12.38	3.33	1.79	17.50	15.71	16.00
	Godfrey Co-operative Fert. & Chem. Co., New- ark, N. J.						
160119	H. Sigle, Rhode Hall, N. J.....	13.84	2.44	0.30	16.58	16.28	16.00
	Listers Agri. Chemical Works, Newark, N. J.						
160496	J. C. Welsh. German Valley, N. J.....	13.98	2.71	0.97	17.66	16.69	16.00
	Monmouth Co. Farmers' Ex., Freehold, N. J.						
160087	Monm'h Co. Farmers' Ex., Freehold, N. J.	14.14	2.16	1.04	17.34	16.30	16.00
	Nitrate Agencies Co., New York City.						
16495	James Neilson, New Brunswick, N. J....	13.74	2.13	0.68	16.55	15.87	16.00
	Rasin-Monumental Co., Baltimore, Md.						
16829	G. E. Lippincott, Evesboro, N. J.....	13.04	2.62	2.29	17.95	15.66	16.00
	Ellwood Roberts Co., Philadelphia, Pa.						
16345	Elwood Roberts Co., Winslow, Jct., N. J.	14.62	1.89	1.03	17.54	16.51	16.00
	F. S. Royster Guano Co., Baltimore, Md.						
16680	T. B. Hurff, Bridgeport, N. J.....	12.22	4.18	0.84	17.24	16.40	16.00
	South Jersey Farmers' Ex., Woodstown, N. J.						
16138	So. Jersey Farmers' Ex., Woodstown, N. J.	15.72	2.24	0.37	18.33	17.96	16.00
	Standard Guano Co., Baltimore, Md.						
16975	W. W. Twaddell, Lumberton, N. J.....	13.34	2.36	0.68	16.38	15.70	16.00
	Geo. F. Taylor Com. Co., New York City.						
16937	C. C. Hulsart, Matawan, N. J.....	15.58	1.12	0.42	17.12	16.70	.....
	I. P. Thomas & Son Co., Philadelphia, Pa.						
16661	W. H. Parkhurst, Hammonton, N. J.....	14.14	1.07	0.97	16.18	15.21	16.00
16853	Albert Haines, Masonville, N. J.....	13.24	3.04	0.82	17.10	16.28	16.00
	Trenton Bone Fertilizer Co., Trenton, N. J.						
160147	Bennett & Bennett, Prospect Plains, N. J.	13.54	3.07	0.17	16.78	16.61	16.00
	F. W. Tunnell & Co., Inc., Philadelphia, Pa.						
16141	D. H. Kirkpatrick, Jamesburg, N. J.....	14.28	2.29	0.82	17.39	16.57	16.00
	Virginia-Carolina Chemical Co., N. Y. City.						
160368	J. C. Voorhees, White House Sta., N. J..	13.84	1.92	1.09	16.85	15.76	16.00
	W. Wilde, Vineland, N. J.						
16545	W. Wilde, Vineland, N. J.....	15.00	1.39	0.73	17.12	16.39	16.00
	Woodward & Dickerson, Philadelphia, Pa.						
16187	J. Wenderoth & Son, Camden, N. J.....	13.90	2.18	0.51	16.59	16.08	16.00
	Average .....	.....	.....	.....	.....	16.15	.....

## 14 PER CENT ACID PHOSPHATE.

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	PHOSPHORIC ACID.					
		Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total.	Available.	
						Found.	Guaranteed.
	American Agri. Chemical Co., New York City.						
16400	J. P. Davis, Bridgeton, N. J. ....	10.98	3.81	1.30	16.09	14.79	14.00
16758	College Farm, New Brunswick, N. J. ....	10.94	3.40	1.06	15.40	14.34	14.00
160355	D. H. Miller, White House, N. J. (Pack- ers' Union) .....	10.52	3.57	1.18	15.27	14.09	14.00
	Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.						
160134	A. C. Beekman, Cranbury, N. J. ....	11.70	1.23	0.47	13.40	12.93	14.00
	J. H. Baird & Son, Marlboro, N. J.						
16071	J. H. Baird & Son, Marlboro, N. J. ....	10.60	3.51	1.08	15.19	14.11	14.00
	Baugh & Sons Co., Philadelphia, Pa.						
160353	J. Smith & Co., Stockton, N. J. ....	14.92	2.26	1.00	18.18	17.18	14.00
	Bowker Fertilizer Co., New York City.						
160336	A. Hoffman, Mendham, N. J. ....	10.34	4.57	1.01	15.92	14.91	14.00
	Consumers' Chemical Corp., New York City.						
160289	H. W. Van Artsdalen, Titusville, N. J. ....	13.80	1.27	0.36	15.37	15.07	14.00
	Godfrey Co-operative Fert. & Chem. Co., New- ark, N. J.						
160415	A. G. Cole, Three Bridges, N. J. ....	12.64	1.46	0.55	14.65	14.10	14.00
	S. M. Hess & Bro., Inc., Philadelphia, Pa.						
16783	J. F. Johnson, Lakewood, N. J. ....	10.86	2.88	2.44	16.18	13.74	14.00
	Hubbard Fertilizer Co., Baltimore, Md.						
160177	S. M. Wikoff, East Millstone, N. J. ....	11.76	3.08	1.19	16.03	14.84	14.00
	H. H. Hutchinson, Jr., Robbinsville, N. J.						
160053	H. H. Hutchinson, Jr., Robbinsville, N. J.	10.00	4.33	2.33	16.66	14.33	14.00
	H. B. Kemp, Long Branch, N. J.						
16881	David A. Groves, Long Branch, N. J. ....	13.38	3.13	0.65	17.16	16.51	14.00
	Listers Agri. Chemical Works, Newark, N. J.						
160313	A. T. Alpaugh, New Germantown, N. J. ....	12.04	3.50	1.05	16.59	15.54	14.00
	Martin Fertilizer Co., Philadelphia, Pa.						
16388	J. Rouse, Blue Anchor, N. J. ....	13.56	1.32	0.85	15.73	14.88	14.00
16723	J. Sampson, Winslow, N. J. ....	12.82	1.98	1.22	16.02	14.80	14.00
	Nassau Fertilizer Co., New York City.						
16294	T. Schleinkofer, Atco, N. J. ....	9.42	4.82	1.01	15.25	14.24	14.00
	Patapsco Guano Co., Baltimore, Md.						
160277	Elmer Hawk, Lambertville, N. J. ....	9.70	4.12	1.27	15.09	13.82	14.00
160410	S. F. Opdyke, Frenchtown, N. J. ....	9.50	4.37	1.45	15.32	13.87	14.00
	Philadelphia Guano Works, Philadelphia, Pa.						
160404	C. Brokaw, North Branch, N. J. ....	4.76	9.92	1.92	16.60	14.68	14.00
	R. A. Reichard, Allentown, Pa.						
160459	J. J. Van Scoten, Delaware, N. J. ....	10.92	3.06	0.61	14.59	13.98	14.00
	F. S. Royster Guano Co., Baltimore, Md.						
16575	C. Ronchetti, Vineland, N. J. ....	-6.56	8.75	1.07	16.38	15.31	14.00

**14 PER CENT ACID PHOSPHATE—(Continued).**

Station Number.	MANUFACTURER OR DEALER AND PLACE OF SAMPLING.	PHOSPHORIC ACID.					
		Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total.	Available.	
						Found.	Guaranteed.
160481	Ruckman Bros., New Brunswick, N. J. Ruckman Bros., New Brunswick, N. J. . . .	12.88	1.50	1.06	15.44	14.38	14.00
16759	Swift & Co., Kearny, N. J. College Farm, New Brunswick, N. J. . . . .	11.10	2.90	0.62	14.62	14.00	14.00
160140	Mershon & Clayton, Monmouth Jct., N. J. I. P. Thomas & Son Co., Philadelphia, Pa.	11.84	2.27	0.63	14.74	14.11	14.00
16542	Training School, Vineland, N. J. . . . .	10.44	3.14	1.06	14.64	13.58	14.00
160387	E. N. Strong, Ringoes, N. J. . . . .	11.76	2.46	1.23	15.45	14.22	14.00
160275	F. W. Tunnell & Co., Inc., Philadelphia, Pa. H. W. Van Artsdalen, Titusville, N. J. . . .	7.70	5.89	1.43	15.02	13.59	14.00
160374	C. S. Eick, White House Sta., N. J. . . . .	7.16	6.88	1.44	15.48	14.04	14.00
16548	Union Chem. Works, Inc., North Wales, Pa. Allivine Farms, Norma, N. J. . . . .	10.94	3.51	0.90	15.35	14.45	14.00
16872	Virginia-Carolina Chemical Co., N. Y. City. J. P. Sproul, Keyport, N. J. . . . .	13.12	1.95	0.37	15.44	15.07	14.00
	Average . . . . .	.....	.....	.....	.....	14.50	.....

**15 PER CENT ACID PHOSPHATE.**

16004	Woodward & Dickerson, Philadelphia, Pa. N. E. Diamant & Son, Cedarville, N. J. . .	12.24	3.01	0.90	16.15	15.25	15.00
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**12 PER CENT ACID PHOSPHATE.**

16795	S. Lederer & Son, New Brunswick, N. J. S. Lederer & Son, New Brunswick, N. J.	9.36	3.30	0.24	12.90	12.66	.....
160211	Swift & Co., Kearny, N. J. J. T. Van Nest, Martinsville, N. J. . . . .	6.80	3.77	0.71	11.28	10.57	12.00

**BASIC LIME PHOSPHATE.**

16686	American Agri. Chemical Co., New York City. W. H. Friedhofer, Cologne, N. J. . . . .	1.64	9.64	1.08	12.36	11.28	13.00
160392	J. Apgar, Califon, N. J. . . . .	2.66	10.39	2.31	15.36	13.05	13.00
	Average . . . . .	.....	.....	.....	.....	12.15	.....

## The Examination of Home Mixtures

Thirteen samples of home mixtures were examined, and the results are tabulated on following pages. The formulas used in preparing these mixture are:

### No. 16356.

100 lbs. Nitrate of Soda.  
100 " Sulphate of Ammonia.  
100 " Dried Blood.  
150 " Tankage.  
550 " Acid Phosphate.

### No. 160379.

700 lbs. Tankage.  
300 " Ground Bone.

### No. 160084.

150 lbs. Nitrate of Soda.  
120 " Sulphate of Ammonia.  
30 " Dried Blood.  
80 " Tankage.  
100 " Ground Bone.  
1240 " Acid Phosphate.  
80 " Sulphate of Potash.

### No. 16843.

2490 lbs. Nitrate of Soda.  
2400 " Sulphate of Ammonia.  
2400 " Dried Blood.  
2334 " Tankage.  
2400 " Ground Bone.  
12000 " Acid Phosphate.

### No. 160268.

167 lbs. 2-8-2.  
125 " Dried Fish.

### No. 160590.

200 lbs. Nitrate of Soda.  
200 " Sulphate of Ammonia.  
225 " Dried Blood.  
400 " Tankage.  
400 " Ground Bone.  
600 " Acid Phosphate.

### No. 160446

700 lbs. Tankage.  
300 " Ground Bone.  
500 " Acid Phosphate.

### No. 16005.

10 lbs. Nitrate of Soda.  
75 " Dried Blood.  
200 " Acid Phosphate.

### No. 16844.

200 lbs. Nitrate of Soda.  
200 " Sulphate of Ammonia.  
200 " Dried Blood.  
300 " Tankage.  
1100 " Acid Phosphate.

### No. 160269.

167 lbs. 2-8-5.  
100 " Nitrate of Soda.  
167 " Acid Phosphate.

### No. 16780.

150 lbs. Nitrate of Soda.  
120 " Sulphate of Ammonia.  
30 " Dried Blood.  
280 " Tankage.  
100 " Ground Bone.  
1240 " Acid Phosphate.  
80 " Potash.

### No. 16253.

200 lbs. Nitrate of Soda.  
200 " Sulphate of Ammonia.  
200 " Dried Blood.  
200 " Tankage.  
200 " Ground Bone.  
1000 " Acid Phosphate.\*

### No. 16516.

100 lbs. Nitrate of Soda.  
2000 " 7-8-0.

### Tabulations of Mixed Fertilizers

It is our desire to make the reports of the inspections as helpful as possible, and since some have claimed that the method which has been used during the past few years for reporting the character of the organic nitrogen content is complicated and not easily interpreted, the method of reporting the organic nitrogen has been changed.

In order that there may be a clear understanding as to the changes referred to above, a few words of explanation may not be out of place. The organic nitrogen content of a fertilizer is reported under two headings: "soluble organic" and "insoluble organic." The figures given under the heading "soluble organic" show the amount of organic nitrogen that is soluble in water, and the figures under the heading "insoluble organic" show the amount that is not soluble in water. If the examination has shown the insoluble nitrogen to be derived from good materials, no additional statement is made; but if the examination has shown it to be derived from materials of an inferior grade, the result is given an appropriate figure which refers to a note at the bottom of the page. This reference gives a statement of the quality of the insoluble nitrogen and also gives the percentage of activity as found by the "alkaline permanganate" method.

By this change it is hoped that every one who desires to be informed about his fertilizer can find the information in an available form.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
<b>HOME MIXTURES.</b>		
16356	D. L. Ballinger .....	Moorestown .....
160590	A. E. Conrow .....	Moorestown .....
160379	J. S. Cray .....	Oakdale .....
160446	J. S. Cray—Corn Fertilizer .....	Dilts Corner .....
160084	D. D. Denise .....	Freehold .....
16005	N. E. Diamant and Son .....	Cedarville .....
16843	N. Dudley .....	Masonville .....
16844	Albert Haines .....	Masonville .....
160268	T. R. Hunt—Corn Fertilizer .....	Lambertville .....
160269	T. R. Hunt—Tomato Fertilizer .....	Lambertville .....
16780	J. Ketchum .....	Farmingdale .....
16516	A. R. Kohler .....	Westville .....
16253	F. Lippincott .....	Moorestown .....
<b>REGULAR BRANDS.</b>		
Acme Guano Co., Baltimore, Md.		
16178	Special Ammoniated Mixture .....	Alloway .....
16180	Ammoniated Fish Guano .....	Alloway .....
16196	Special Sweet Potato .....	Mt. Ephraim .....
16231	Fish Mixture .....	Blackwood .....
16230	Acme Early Truck .....	Blackwood .....
16234	Potato Climax .....	Blackwood .....
16589	Harvest King .....	Swedesboro .....
American Agricultural Chemical Company, New York City.		
160060	Ammoniated Fertilizer AAAA .....	Jamesburg .....
16058	Superior Fish Guano for Broadcasting .....	Delanco .....
16702	<sup>1</sup> Superior Fish Guano for Broadcasting .....	Blackwood .....
16076	Grain Grower No. 3 .....	Freehold .....
16942	Complete Manure for Top Dressing, 1916 .....	Keyport .....
16078	Great Truck Special .....	Freehold .....
16161	Homestead Good Grower .....	Salem .....
16720	High Grade Ammoniated Fertilizer .....	Waterford .....
16304	<sup>1</sup> High Grade Ammoniated Fertilizer .....	Atco .....
16405	Special Grass and Garden Mixture, 1916 .....	Bridgeton .....
16416	<sup>1</sup> Special Grass and Garden Mixture, 1916 .....	Mickleton .....
16684	Asparagus and Truck Fertilizer .....	Cologne .....
16736	General Crop Grower .....	Toms River .....

<sup>1</sup> Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.						POTASH.		
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.
											Found.	Guaranteed.		
1.16	3.52	0.14	1.37	6.19	.....	8.96	0.94	1.08	10.98	.....	9.90	.....	.....	.....
1.55	2.12	0.40	2.72	6.79	.....	3.80	2.36	4.98	11.14	.....	6.16	.....	.....	.....
....	0.35	0.89	3.79	5.03	.....	0.60	7.52	4.57	12.69	.....	8.12	.....	.....	.....
....	0.23	0.54	2.47	3.24	.....	5.50	4.34	5.08	14.92	.....	9.84	.....	.....	.....
1.18	1.15	0.26	0.83	3.42	.....	9.16	2.29	2.06	13.51	.....	11.45	.....	*2.08	.....
0.53	0.11	0.06	2.41	3.11	.....	9.20	2.99	0.67	12.86	.....	12.19	.....	.....	.....
1.80	2.33	0.12	1.79	6.04	.....	6.30	2.61	2.49	11.40	.....	8.91	.....	.....	.....
1.51	2.16	0.10	1.98	5.75	.....	7.44	2.08	1.43	10.95	.....	9.52	.....	.....	.....
1.26	0.12	0.37	2.56	4.31	.....	4.32	4.06	0.96	9.34	.....	8.38	.....	0.57	.....
4.28	....	0.10	0.11	4.49	.....	6.76	2.54	0.67	9.97	.....	9.30	.....	0.54	.....
1.10	1.33	0.28	0.74	3.45	.....	9.12	2.48	1.57	13.17	.....	11.60	.....	2.34	.....
1.02	2.98	0.65	1.38	6.03	.....	5.60	1.91	1.26	8.77	.....	7.51	.....	.....	.....
1.25	1.62	0.06	2.04	4.97	.....	7.28	1.89	1.91	11.08	.....	9.17	.....	.....	.....
Tr.	0.02	0.17	<sup>1</sup> 0.58	0.77	0.82	1.18	6.64	2.57	10.39	.....	7.82	8.00	.....	.....
....	0.04	0.34	<sup>2</sup> 1.82	2.20	2.46	5.92	3.72	0.63	10.27	.....	9.64	8.00	1.89	1.00
....	0.02	0.33	1.31	1.66	1.65	2.16	5.57	1.15	8.88	.....	7.73	8.00	2.32	2.00
....	0.03	0.40	1.81	2.24	2.47	5.88	3.04	0.93	9.85	.....	8.92	8.00	2.13	2.00
....	0.07	0.29	2.86	3.22	4.12	6.34	1.30	0.76	8.40	.....	7.64	7.00	2.25	2.00
....	0.05	0.44	3.24	3.73	3.25	5.52	2.07	0.29	7.88	.....	7.59	8.00	1.81	2.00
....	0.01	0.19	<sup>3</sup> 0.52	0.72	0.82	7.76	3.25	1.49	12.50	.....	11.01	10.00	2.06	2.00
0.39	0.76	0.86	1.22	3.23	3.29	7.92	2.51	0.89	11.32	11.00	10.43	10.00	.....	.....
0.76	0.50	0.35	1.08	2.69	3.29	0.94	4.61	1.10	6.65	6.00	5.55	5.00	0.94	1.00
0.61	0.45	0.41	0.87	2.34	3.29	0.90	4.96	1.06	6.92	6.00	5.86	5.00	1.11	1.00
....	0.14	0.76	0.73	1.63	1.65	7.32	2.25	2.19	11.76	10.00	9.57	9.00	1.04	1.00
2.31	1.19	0.12	0.74	4.36	4.11	4.18	4.37	1.03	9.58	9.00	8.55	8.00	0.89	1.00
....	2.26	0.77	1.31	4.34	4.11	7.74	2.12	2.29	12.15	11.00	9.86	10.00	.....	.....
0.44	0.49	0.23	0.70	1.86	2.06	4.04	4.54	1.29	9.87	9.00	8.58	8.00	.....	.....
0.85	1.16	0.39	1.28	3.68	4.11	2.82	6.02	1.82	10.66	9.00	8.84	8.00	.....	.....
0.57	1.32	0.46	2.00	4.35	4.11	3.50	4.64	1.09	9.23	9.00	8.14	8.00	.....	.....
2.44	2.67	0.27	1.61	6.99	8.23	3.78	3.07	0.80	7.65	6.00	6.85	5.00	0.96	1.00
1.38	2.39	0.53	1.39	5.69	8.23	2.88	3.88	1.24	8.00	6.00	6.76	5.00	1.12	1.00
0.78	1.04	0.44	1.83	4.09	4.11	3.34	5.44	1.00	9.78	9.00	8.78	8.00	1.08	1.00
....	0.53	0.54	0.64	1.71	1.65	5.72	4.54	1.27	11.53	10.00	10.26	9.00	0.92	1.00

\*Potash largely, if not entirely, from sulphate.

<sup>1</sup> Inferior quality. Activity 30%.

<sup>2</sup> Inferior quality. Activity 45%.

<sup>3</sup> Inferior quality. Activity 28%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	American Agricultural Chemical Co., New York City.—(Cont.)	
160154	<sup>1</sup> Bradley's Half Century Fertilizer .....	Plainsboro .....
160155	<sup>1</sup> Bradley's Vegetable Fertilizer .....	Plainsboro .....
160231	Bradley's Complete Manure for Potatoes and Vegetables, 1916 .....	Trenton .....
160393	Bradley's Unicorn, 1916 .....	North Branch .....
16732	Crocker's Best Truck Manure, 1916 .....	Toms River .....
16733	Crocker's Special Potato Fertilizer, 1916 .....	Toms River .....
160181	Crocker's Universal Grain Grower, 1916 .....	East Millstone .....
16940	East India Potato and Garden Manure .....	Matawan .....
16941	East India Mayflower, 1916 .....	Keyport .....
160175	East India Corn King, 1916 .....	Pennington .....
160255	Great Eastern Wheat Special, 1916 .....	Basking Ridge .....
160204	Milsom's Wheat, Oats and Barley, 1916 .....	Bound Brook .....
160205	Milsom's Potato and Cabbage Manure, 1916 .....	Bound Brook .....
16484	Moro-Phillips Spec. No. 1 Potato and Truck Manure, 1916 .....	Thorofare .....
16487	Moro-Phillips High Grade Truck Manure, 1916 .....	Thorofare .....
160285	Northwestern Diamond Potash Mixture, 1916 .....	Titusville .....
160286	Northwestern Shawnee Phosphate, 1916 .....	Titusville .....
16645	Packer's Union Potato Manure 1916 .....	Erma .....
16646	Packer's Union Superior Crop Grower, 1916 .....	Erma .....
160356	Packer's Union Universal Fertilizer, 1916 .....	White House .....
160314	Potomac Golden Potato Manure .....	Mendham .....
160315	Potomac Sure Growth Fertilizer .....	Mendham .....
16685	Preston's Corn, Tomato and Potato Guano, 1916 .....	Cologne .....
16687	Preston's Special New Jersey Brand, 1916 .....	Cologne .....
16708	Preston's High Grade Potato Manure, 1916 .....	Cologne .....
160470	Read's H. G. Farmers' Friend Superphosphate, 1916 .....	Ramsey .....
160471	Read's Farmers' Friend Superphosphate, 1916 .....	Ramsey .....
160472	Read's Corn, Wheat and Rye, 1916 .....	Ramsey .....
160317	Sharpless & Carpenter's Potato, Corn and Truck Guano, 1916 .....	New Germantown .....
16626	Sharpless & Carpenter's Vegetable and Potato Manure, 1916 .....	Cape May City .....
16647	Sharpless & Carpenter's Fish Guano, 1916 .....	Rio Grande .....
16628	Sharpless & Carpenter's Soluble Tampico Guano, 1916 .....	Cape May City .....
160431	<sup>1</sup> Sharpless & Carpenter's Complete Manure, Special .....	Neshanic .....
16160	Tygart-Allen's Star Brand Phosphate, 1916 .....	Salem .....
16703	Tygart-Allen's Soluble Marine Guano, 1916 .....	Blackwood .....
16704	Allen's Potato and Truck Manure, 1916 .....	Blackwood .....
160040	Tygart-Allen's Standard Corn and Wheat, 1916 .....	Crosswicks .....
160041	Tygart-Allen's Star Potato Grower, 1916 .....	Crosswicks .....

<sup>1</sup> 1915 shipment.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.						POTASH.		
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.
											Found.	Guaranteed.		
....	0.68	0.55	0.67	1.90	2.06	2.78	5.50	1.44	9.72	9.00	8.28	8.00	2.75	3.00
....	1.44	0.80	0.86	3.10	3.29	6.60	3.21	1.91	11.72	11.00	9.81	10.00	3.25	3.00
0.65	0.81	1.16	0.74	3.36	3.29	5.54	4.34	1.30	11.18	10.00	9.88	9.00	0.96	1.00
....	0.45	0.32	0.60	1.37	1.65	7.04	4.00	1.13	12.17	10.00	11.04	9.00	0.34	1.00
0.93	1.10	0.25	1.06	3.34	4.11	4.62	5.09	0.93	10.64	9.00	9.71	8.00	1.17	1.00
0.43	1.22	0.41	0.80	2.86	3.29	5.32	4.50	1.18	11.00	10.00	9.82	9.00	0.98	1.00
....	0.08	0.32	0.43	0.83	0.82	4.48	4.18	1.96	10.62	9.00	8.66	8.00	0.77	1.00
....	1.72	0.49	1.00	3.21	3.29	4.84	4.42	1.91	11.17	10.00	9.26	9.00	0.97	1.00
....	0.26	0.50	0.59	1.35	1.65	5.02	4.98	1.60	11.60	10.00	10.00	9.00	0.93	1.00
....	1.27	0.42	0.87	2.56	2.47	6.54	3.12	1.55	11.21	10.00	9.66	9.00	0.98	1.00
....	0.61	0.54	0.71	1.86	2.06	5.64	3.84	1.58	11.06	9.00	9.48	8.00	0.75	1.00
....	0.09	0.17	0.55	0.81	0.82	4.66	4.23	1.86	10.75	9.00	8.89	8.00	0.86	1.00
....	0.09	0.23	0.65	0.97	0.82	6.74	4.12	2.07	12.93	11.00	10.86	10.00	0.95	1.00
....	0.97	0.49	0.62	2.08	2.47	5.76	4.37	0.99	11.12	10.00	10.13	9.00	0.92	1.00
0.48	1.29	0.35	0.90	3.02	3.29	4.14	5.16	1.17	10.47	10.00	9.30	9.00	1.03	1.00
0.26	0.28	0.53	0.52	1.59	1.65	7.28	3.62	1.43	12.33	11.00	10.90	10.00	0.88	1.00
0.43	0.11	0.61	0.57	1.72	1.65	5.78	3.69	1.63	11.10	10.00	9.47	9.00	0.92	1.00
0.29	0.85	0.25	0.50	1.89	2.06	5.64	5.15	1.21	12.00	11.00	10.75	10.00	1.04	1.00
....	0.10	0.36	0.41	0.87	0.82	5.46	4.93	1.36	11.75	11.00	10.39	10.00	0.90	1.00
....	0.07	0.21	0.38	0.66	0.82	3.78	4.24	1.58	9.60	9.00	8.02	8.00	0.90	1.00
....	1.20	1.17	0.85	3.22	3.29	7.12	3.32	0.97	11.41	10.00	10.44	9.00	0.92	1.00
0.20	0.12	0.94	0.60	1.86	1.65	6.66	3.56	1.67	11.89	11.00	10.22	10.00	.....	.....
....	0.55	0.58	0.68	1.81	1.65	5.84	4.87	1.17	11.88	10.00	10.71	9.00	1.00	1.00
....	0.80	0.47	0.81	2.08	2.47	5.62	4.43	1.37	11.42	10.00	10.05	9.00	1.14	1.00
0.41	1.24	0.35	0.71	2.71	3.29	5.26	4.58	1.28	11.12	10.00	9.84	9.00	0.96	1.00
....	1.71	0.56	0.85	3.12	3.29	6.18	3.58	1.22	10.98	10.00	9.76	9.00	1.00	1.00
....	0.65	0.38	0.88	1.91	2.06	5.30	3.64	1.51	10.45	9.00	8.94	8.00	0.96	1.00
....	0.20	0.49	0.59	1.28	1.65	4.72	5.04	1.52	11.28	10.00	9.76	9.00	0.85	1.00
....	0.29	0.42	0.67	1.38	1.23	7.32	4.30	1.06	12.68	11.00	11.62	10.00	1.12	1.00
....	0.99	0.59	0.60	2.18	2.47	6.00	4.28	0.98	11.26	10.00	10.28	9.00	0.99	1.00
....	0.75	0.69	0.61	2.05	2.06	4.90	4.40	0.86	10.16	9.00	9.30	8.00	0.97	1.00
0.52	1.28	0.25	0.78	2.83	3.29	4.30	5.24	1.29	10.83	10.00	9.54	9.00	1.30	1.00
....	0.18	0.85	0.66	1.69	1.65	5.66	3.18	1.92	10.76	10.00	8.84	9.00	3.15	3.00
0.16	0.69	0.40	0.62	1.87	2.06	6.00	3.79	1.40	11.19	9.00	9.79	8.00	0.78	1.00
0.47	1.33	0.40	0.86	3.06	3.29	5.54	4.17	1.16	10.87	10.00	9.71	9.00	0.99	1.00
0.12	1.00	0.42	0.76	2.30	2.47	5.66	4.31	1.20	11.17	10.00	9.97	9.00	0.98	1.00
Tr.	0.17	0.34	0.46	0.97	0.82	5.66	5.05	1.38	12.09	11.00	10.71	10.00	0.91	1.00
....	0.35	0.35	0.53	1.23	1.23	5.76	5.35	1.35	12.46	11.00	11.11	10.00	1.02	1.00

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	American Agricultural Chemical Co., New York City.—(Cont.)	
16355	Wheeler's Potato Manure, 1916 .....	Kirkwood .....
160243	Wheeler's Royal Wheat Grower, 1916 .....	Basking Ridge .....
16630	Wheeler's High Grade Special, 1916 .....	Cold Spring .....
16965	Wheeler's Corn Fertilizer, 1916 .....	Beverly .....
	American Fertilizing Co., Baltimore, Md.	
16267	American Truck and Vegetable Ammoniated Phosphate.....	Daretown .....
16460	American Potato and Vegetable Compound .....	Shiloh .....
	Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.	
16117	Armour's 4-10 Fertilizer .....	Beverly .....
16118	Armour's 5-10 Fertilizer .....	Beverly .....
16236	<sup>1</sup> Armour's 5-10 Fertilizer .....	Cuews Landing .....
160135	<sup>2</sup> Armour's 4-8-3 .....	Cranbury .....
160232	Corn Fertilizer .....	Skillman .....
160233	Late Potato Fertilizer .....	Skillman .....
160234	Oats and Peas Fertilizer .....	Skillman .....
160281	Truck Fertilizer .....	Skillman .....
160282	Top Dressing Fertilizer .....	Skillman .....
160536	Armour's General Truck Fertilizer No. 2 .....	Greystone Park .....
160537	Armour's Potato Fertilizer No. 2 .....	Greystone Park .....
160538	Armour's Corn Fertilizer, No. 2 .....	Greystone Park .....
	Atlantic Fertilizer Works, Baltimore, Md.	
16154	Atlantic 4-10-1 Brand .....	Salem .....
16155	Atlantic 4-10-0 Brand .....	Salem .....
	J. H. Baird & Son, Marlboro, N. J.	
16069	J. H. Baird's 4-10-0 .....	Marlboro .....
16070	J. H. Baird's 5-9-0 .....	Marlboro .....
160076	Special Mixture No. 1 .....	Marlboro .....
	Baugh & Sons Co., Philadelphia, Pa.	
160186	Baugh's The Old Stand-by Dissolved Animal Base .....	Belle Mead .....
160188	Baugh's H. G. Ammoniated Animal Base .....	Belle Mead .....
160189	Baugh's Ammoniated Superphosphate .....	Belle Mead .....
16126	Special Mixture No. 5 .....	Moorestown .....
16229	Special Mixture No. 7 .....	Clayton .....
16107	Baugh's Superlative Truck Grower, without Potash .....	Fish House .....
16106	Baugh's H. G. Potato Grower, without Potash .....	Fish House .....
16108	Baugh's New Process 10% Guano, without Potash, 1916.....	Fish House .....
16636	Baugh's Potato and Truck Special for All Truck Crops, 1916.	Cape May City .....
16366	Baugh's H. G. Potato Grower, 1916 .....	Salem .....
160388	Baugh's Special Potato Manure, 1916 .....	Ringoos .....
16384	Baugh's General Crop Grower for All Crops .....	Camden .....

<sup>1</sup> Duplicate sample.<sup>2</sup> 1915 shipment.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.								POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.	
											Found.	Guaranteed.			
0.34	0.85	0.21	0.50	1.90	2.05	5.38	5.11	1.36	11.85	11.00	10.49	10.00	0.87	1.00	
....	0.07	0.23	0.52	0.82	0.82	4.44	4.74	2.00	11.18	9.00	9.18	8.00	0.61	1.00	
0.40	1.24	0.33	0.66	2.63	3.29	6.56	3.56	0.95	11.07	10.00	10.12	9.00	0.86	1.00	
....	0.57	0.54	0.55	1.66	1.65	5.66	5.24	1.14	12.04	11.00	10.90	10.00	0.96	1.00	
....	2.35	0.29	0.63	3.27	3.29	7.78	2.14	2.08	12.00	11.00	9.92	10.00	.....	.....	
0.30	2.59	0.10	0.37	3.36	3.29	7.92	1.65	1.35	10.92	11.00	9.57	10.00	2.45	2.00	
....	1.44	0.24	1.44	3.12	3.29	8.12	2.07	0.86	11.05	10.50	10.19	10.00	.....	.....	
....	1.30	0.23	2.18	3.71	4.11	7.74	2.80	1.07	11.61	10.50	10.54	10.00	.....	.....	
....	1.32	0.07	2.34	3.73	4.11	7.90	2.43	1.20	11.53	10.50	10.33	10.00	.....	.....	
0.29	0.48	0.39	1.62	2.78	3.29	5.26	1.74	1.54	8.54	8.50	7.00	8.00	3.07	3.00	
0.12	0.75	0.19	1.26	2.32	2.47	6.42	1.83	0.55	8.80	9.50	8.25	9.00	2.58	3.00	
....	0.53	0.10	0.95	1.58	1.65	7.96	1.88	0.73	10.57	10.50	9.84	10.00	2.73	3.00	
....	0.60	0.11	0.97	1.68	1.65	8.00	1.83	0.77	10.60	10.50	9.83	10.00	2.69	3.00	
1.48	3.09	0.25	0.98	5.80	6.56	8.94	0.44	0.19	9.57	9.50	9.38	9.00	3.16	3.00	
4.41	4.37	0.61	2.59	11.98	12.29	4.68	0.75	0.12	5.55	6.50	5.43	6.00	3.60	3.00	
2.07	1.97	0.31	1.07	5.42	5.60	6.80	0.96	2.53	10.29	10.00	7.76	7.00	.....	.....	
2.29	2.15	0.17	0.76	5.37	5.76	7.06	0.84	0.45	8.35	8.00	7.90	7.52	.....	.....	
1.38	0.16	0.11	0.94	2.59	2.90	8.64	1.09	1.35	11.08	11.00	9.73	9.00	.....	.....	
0.59	0.14	0.26	1.97	2.96	3.29	6.26	3.78	1.51	11.55	10.00	10.04	10.00	0.91	1.00	
....	0.52	0.47	1.44	2.43	3.29	8.28	2.29	2.23	12.80	10.00	10.57	10.00	.....	.....	
1.81	0.31	0.29	1.11	3.52	3.29	6.48	3.11	2.56	12.15	12.00	9.59	10.00	.....	.....	
2.11	0.14	0.49	1.15	3.89	4.12	6.76	3.15	2.31	12.22	11.00	9.91	9.00	.....	.....	
6.64	0.01	0.31	1.55	8.51	8.23	5.04	1.36	0.86	7.26	6.00	6.40	5.00	.....	.....	
....	1.11	0.11	0.29	1.51	1.65	9.90	1.93	1.13	12.96	12.00	11.83	12.00	.....	.....	
....	2.01	0.39	0.77	3.17	3.30	8.66	1.63	1.07	11.36	10.00	10.29	10.00	.....	.....	
....	0.38	0.25	1.40	1.03	1.02	8.78	2.42	1.29	12.49	10.00	11.20	10.00	.....	.....	
1.39	1.66	0.29	1.87	5.21	5.39	6.80	1.85	2.35	11.00	.....	8.65	8.00	.....	.....	
1.24	0.16	0.53	3.99	5.92	5.76	1.54	6.75	3.37	11.66	11.50	8.29	4.00	.....	.....	
....	4.09	0.28	1.17	5.54	5.76	8.16	1.22	1.07	10.45	8.00	9.38	8.00	.....	.....	
....	1.25	0.33	1.66	3.24	3.30	6.56	1.90	2.08	10.54	8.00	8.46	8.00	.....	.....	
0.64	5.85	0.32	0.89	7.70	8.23	6.32	0.94	0.88	8.14	6.00	7.26	6.00	.....	.....	
....	1.34	0.27	1.17	2.78	2.88	8.54	2.06	1.73	12.33	10.00	10.60	10.00	1.22	1.00	
....	1.67	0.25	1.25	3.17	3.30	7.10	2.25	1.75	11.10	8.00	9.35	8.00	1.11	1.00	
Tr.	0.64	0.29	2.064	1.57	1.65	8.34	2.41	1.97	12.72	10.00	10.75	10.00	0.99	1.00	
....	0.11	0.32	2.046	0.89	0.82	6.20	2.88	3.09	12.17	8.00	9.08	8.00	0.91	1.00	

<sup>1</sup> Inferior quality. Activity 45%.<sup>2</sup> Inferior quality. Activity 49%.<sup>3</sup> Inferior quality. Activity 40%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Bennett & Bennett, Prospect Plains, N. J.	
16444	Bennett's XX Potato Ammoniated Phosphate .....	Prospect Plains .....
16445	Bennett's Special .....	Prospect Plains .....
	The Berg Co., Philadelphia, Pa.	
16688	Berg's New Standard Bone Manure .....	Hammonton .....
160023	Berg's Animal Bone and Meat .....	Columbus .....
160445	Berg's New Special Bone Manure .....	Belvidere .....
	Berger Bros., Easton, Pa.	
160461	Lehigh Superphosphate, 1916 .....	Asbury .....
	Bowker Fertilizer Co., New York City.	
16086	Bowker's Superphosphate with 3% Ammonia .....	Freehold .....
16279	Bowker's Superphosphate with 5% Ammonia .....	Daretown .....
16087	Bowker's Superphosphate with 4% Ammonia .....	Freehold .....
16088	Stockbridge Early Crop Manure, 1916 .....	Freehold .....
16320	<sup>1</sup> Stockbridge Early Crop Manure, 1916 .....	Waterford .....
160065	Stockbridge General Crop Manure, 1916 .....	Tennent .....
16998	Bowker's Hill and Drill Phosphate, 1916 .....	Red Bank .....
16323	Bowker's Sweet Potato and Truck Manure, 1916 .....	Waterford .....
	Burlington County Produce Sales Co., Mt. Holly, N. J.	
16148	Holly Truck and Potato Fertilizer .....	Mt. Holly .....
16149	Holly Special Harrison Formula Fertilizer .....	Mt. Holly .....
16888	Holly Favorite Fertilizer .....	Mt. Holly .....
16972	Holly Special Diamond A Fertilizer* .....	Mt. Holly .....
16974	Holly Special Corn Grower .....	Mt. Holly .....
	Burlington Supply Co., Burlington, N. J.	
160025	B. S. C. Special Truck Manure, 1916 .....	Burlington .....
160026	B. S. C. Pea and Bean Manure, 1916 .....	Burlington .....
160027	Riggs' Fish Guano, 1916 .....	Burlington .....
	Chamberlin & Barclay, Cranbury, N. J.	
160152	1916 Special Top Dressing .....	Cranbury .....
	Coe-Mortimer Co., New York City.	
16422	E. Frank Coe's Prolific Crop Producer, 1916 .....	Merchantville .....
16391	<sup>1</sup> E Frank Coe's Prolific Crop Producer, 1916 .....	Blue Anchor .....
16342	E. Frank Coe's Red Brand Excelsior Guano, 1916 .....	Elm .....
16637	E. Frank Coe's Standard Potato Fertilizer, 1916 .....	Cold Spring .....
160203	E. Frank Coe's Gold Brand Excelsior Guano, 1916 .....	Bound Brook .....
	J. S. Collins & Son., Inc., Moorestown, N. J.	
16190	Potato Fertilizer .....	Merchantville .....
16191	Fertilizer for General Use .....	Merchantville .....
16746	4-10 Potato Fertilizer .....	Moorestown .....

<sup>1</sup> Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.								POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.	
											Found.	Guaranteed.			
....	2.25	0.28	0.69	3.22	3.29	5.82	2.11	2.23	10.16	9.00	7.93	8.00	.....	.....	
0.57	0.26	0.81	1.38	3.02	3.29	6.24	3.83	3.56	13.63	11.00	10.07	10.00	.....	.....	
1.07	0.05	0.39	1.18	2.69	3.00	5.70	3.29	3.66	12.65	11.00	8.99	8.00	1.46	1.25	
....	0.50	0.78	2.00	3.28	3.30	4.46	4.27	6.75	15.48	17.00	8.73	.....	.....	.....	
0.34	0.09	0.43	1.17	2.03	2.00	5.82	3.15	4.17	13.14	11.00	8.97	7.00	1.55	1.00	
....	0.10	0.83	0.66	1.59	1.65	6.68	3.74	1.62	12.04	11.00	10.42	10.00	.....	.....	
Tr.	0.84	0.65	0.84	2.33	2.47	7.50	2.82	1.28	11.60	11.00	10.32	10.00	.....	.....	
0.79	1.09	0.51	1.36	3.75	4.11	3.42	4.87	1.26	9.55	9.00	8.29	8.00	.....	.....	
1.11	1.25	0.32	0.54	3.22	3.29	7.68	2.65	1.72	12.05	11.00	10.33	10.00	.....	.....	
1.66	1.07	....	0.69	3.42	4.11	6.08	2.58	1.14	9.80	9.00	8.66	8.00	0.79	1.00	
0.93	1.04	0.49	1.48	3.94	4.11	3.80	5.06	1.38	10.24	9.00	8.86	8.00	1.10	1.00	
0.54	0.92	0.88	0.80	3.14	3.29	6.02	3.80	1.32	11.14	10.00	9.82	9.00	0.95	1.00	
Tr.	1.04	0.35	0.98	2.37	2.47	6.56	3.47	1.08	11.11	10.00	10.03	9.00	0.85	1.00	
....	0.81	0.44	0.61	1.86	1.65	6.68	4.43	0.87	11.98	11.00	11.11	10.00	0.77	1.00	
....	1.76	0.27	1.20	3.23	3.29	5.82	1.36	1.48	8.66	8.00	7.18	8.00	.....	.....	
....	1.61	0.25	1.25	3.11	3.29	7.12	2.09	1.48	10.69	10.00	9.21	10.00	.....	.....	
....	2.09	0.48	1.21	3.78	4.10	7.72	2.31	1.67	11.70	10.00	10.03	10.00	.....	.....	
....	1.09	0.31	0.88	2.28	2.47	6.08	1.98	0.51	8.57	8.00	8.06	8.00	.....	.....	
Tr.	0.56	0.27	0.82	1.65	1.65	7.20	3.12	0.60	10.92	10.00	10.32	10.00	.....	.....	
0.48	1.42	0.13	1.00	3.03	3.29	4.14	4.68	0.92	9.74	9.00	8.82	8.00	.....	.....	
Tr.	0.54	0.71	0.61	1.86	1.65	5.42	4.65	1.47	11.54	11.00	10.07	10.00	.....	.....	
....	1.00	0.53	0.67	2.20	2.47	5.76	4.44	1.08	11.28	10.00	10.20	9.00	0.84	1.00	
4.68	0.06	0.53	1.22	6.49	7.00	6.48	2.20	1.54	10.22	8.00	8.68	5.25	.....	.....	
0.69	0.95	0.48	0.93	3.05	3.29	6.30	4.23	1.67	12.26	11.00	10.53	10.00	.....	.....	
0.59	1.04	0.54	1.12	3.29	3.29	5.60	4.39	1.88	11.87	11.00	9.99	10.00	.....	.....	
0.89	1.20	0.30	1.21	3.60	4.11	3.62	5.77	1.21	10.60	9.00	9.39	8.00	1.30	1.00	
0.33	1.29	0.37	0.78	2.82	3.29	5.08	5.10	1.17	11.35	10.00	10.18	9.00	0.92	1.00	
0.32	0.70	0.78	0.71	2.51	2.47	6.16	3.52	1.55	11.23	10.00	9.68	9.00	0.96	1.00	
....	1.57	0.24	1.41	3.22	3.23	8.12	2.06	1.36	11.54	10.50	10.18	10.00	.....	.....	
....	1.15	0.30	1.05	2.50	2.47	7.34	2.41	1.85	11.60	10.50	9.75	10.00	.....	.....	
1.31	0.21	0.83	0.58	2.93	3.29	5.64	5.05	2.46	13.15	11.00	10.69	10.00	.....	.....	

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Consumers' Chemical Corporation, New York City.	
160288	Consumers' Pure Sure Potato and Vegetable with 2% Potash.	Titusville .....
160290	Consumers' XXX Fish and Potash Mixture .....	Titusville .....
160291	Consumers' Pure Sure Plant Food .....	Titusville .....
	Jas. G. Downward Co., Coatesville, Pa.	
16650	1916 Potato, Corn and Grain Special .....	Cold Spring .....
160199	Special Mixture—Top Dresser .....	Trenton .....
160200	1916 Ammoniated Phosphate .....	Trenton .....
	John Dugan, Moorestown, N. J.	
16767	Dugan's H. G. Potato and Truck Manure .....	Moorestown .....
16851	Dugan's Truck Manure .....	Moorestown .....
	Farmers' Co-operative Association, Trenton, N. J.	
16825	Farmers' Co-operative 4-8-2 Potato Fertilizer .....	White Horse .....
16827	Farmers' Co-operative 3-11½-0 Corn and Grain Special.....	Glenmore .....
16828	Farmers' Co-operative 8½-8-0 Grass Top Dressing .....	Hamilton Square ....
160230	Farmers' Co-operative 4-8-0 Special Fertilizer .....	Pennington .....
	M. Feinstein, Bridgeton, N. J.	
16446	Feinstein's 3-8-3 Fertilizer .....	Bridgeton .....
16447	Feinstein's 2-8-3 Fertilizer .....	Bridgeton .....
	Fogg & Hires Co., Salem, N. J.	
16172	Brand No. 1, 1916, for Potatoes and Truck .....	Salem .....
	Godfrey Co-operative Fertilizer and Chemical Co., Newark, N. J.	
160120	Godfrey's Early Potato Mixture 4-10, Revised .....	Jamesburg .....
160332	Godfrey's Corn Grower, Revised .....	Bernardsville .....
160333	Godfrey's Velvet Lawn Dressing, Revised .....	Bernardsville .....
160334	Godfrey's Premium Potato Manure, Revised .....	Bernardsville .....
160248	Godfrey's Grain and Grass Fertilizer .....	Martinsville .....
160375	Godfrey's Special Potato Mixture 3-8-1, Revised .....	White House .....
	J. C. Griscom, Woodbury, N. J.	
16423	Potato Manure .....	Woodbury .....
16424	Special King Crab Compound .....	Woodbury .....
	Thos. Y. Hackett, Daretown, N. J.	
16266	Hackett's Special Potato Grower .....	Daretown .....
	Hendrickson & Dilatush, Robbinsville, N. J.	
16089	Special Fish Potato Manure .....	East Freehold .....
16090	4-9 Potato Manure .....	East Freehold .....
160046	High Grade Fish Potato Manure .....	Robbinsville .....
16092	Fish Guano for Corn .....	East Freehold .....
	Heritage & Bro., Mullica Hill, N. J.	
16520	Pancoast's XX with 10 Per Cent.....	Mullica Hill .....
16521	Pancoast's Sweet Potato, Revised .....	Mullica Hill .....
16528	Pancoast's Old Reliable Potato Grower .....	Mullica Hill .....
16531	Pancoast's XX, Revised .....	Mullica Hill .....

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.								POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.	
											Found.	Guaranteed.			
0.14	2.12	0.21	0.57	3.04	3.29	8.52	1.84	1.95	12.31	9.00	10.36	8.00	2.01	2.00	
....	0.79	0.17	0.42	1.38	1.65	7.98	1.34	1.86	11.18	9.00	9.32	8.00	0.98	1.00	
....	0.24	0.23	0.43	0.90	0.82	7.72	1.73	1.53	10.98	9.00	9.45	8.00	1.22	1.00	
0.12	1.06	0.04	0.24	1.46	1.65	6.42	2.10	1.01	9.53	.....	8.52	8.00	1.05	1.00	
4.57	0.10	0.10	0.89	5.66	4.90	4.08	2.11	0.53	6.72	6.00	6.19	5.00	.....	.....	
....	.....	0.15	0.49	0.64	0.82	2.30	6.68	1.20	10.18	9.00	8.98	8.00	.....	.....	
....	1.78	0.86	1.33	3.97	4.10	8.14	1.78	2.25	12.17	10.50	9.92	10.00	.....	.....	
....	0.19	0.75	0.63	1.57	1.65	6.70	2.91	1.87	11.48	10.50	9.61	10.00	.....	.....	
....	1.70	0.42	1.05	3.17	3.29	3.88	3.92	2.30	10.10	8.50	7.80	8.00	2.23	2.00	
1.34	0.04	0.14	0.75	2.27	2.47	10.82	2.07	0.39	13.28	12.00	12.89	11.50	.....	.....	
5.28	0.31	0.36	0.36	6.31	6.99	6.00	2.85	0.98	9.83	8.50	8.85	8.00	.....	.....	
....	1.30	0.37	1.35	3.02	3.29	5.66	2.66	2.75	11.07	8.00	8.32	8.00	.....	.....	
....	1.95	0.22	0.18	2.35	2.47	7.52	1.52	0.71	9.75	9.00	9.04	8.00	2.60	3.00	
....	0.31	0.38	0.85	1.54	1.65	5.72	2.30	2.53	10.55	9.00	8.02	8.00	3.34	3.00	
....	0.13	0.56	4.93	5.62	5.76	0.42	3.67	9.29	13.38	12.00	4.09	4.50	.....	.....	
....	1.52	0.31	1.07	2.90	3.29	8.70	1.73	0.62	11.05	10.50	10.43	10.00	.....	.....	
....	0.51	0.27	0.80	1.58	1.65	6.44	3.44	1.07	10.95	10.50	9.88	10.00	0.78	1.00	
....	0.89	0.22	0.91	2.02	2.47	5.30	2.47	0.83	8.60	8.50	7.77	8.00	1.03	1.00	
0.20	1.40	0.22	1.45	3.27	3.29	5.76	2.05	0.90	8.71	8.50	7.81	8.00	1.01	1.00	
....	0.28	0.32	0.54	1.14	1.65	8.40	3.34	1.33	13.07	8.50	11.74	8.00	1.98	2.00	
Tr.	0.12	0.68	1.49	2.29	2.47	5.16	2.84	2.01	10.01	8.50	8.00	8.00	1.27	1.00	
0.89	1.17	0.54	1.52	4.12	4.11	3.56	4.73	1.29	9.58	9.00	8.29	8.00	.....	.....	
0.95	1.03	0.54	1.42	3.94	4.11	3.28	5.34	1.53	10.15	9.00	8.62	8.00	1.14	1.00	
0.54	2.22	0.16	0.41	3.33	3.29	6.88	1.56	1.09	9.53	9.00	8.44	8.00	2.14	2.00	
0.37	1.46	0.20	1.33	3.36	3.29	9.78	2.50	1.01	13.29	11.00	12.28	9.00	.....	.....	
0.42	1.60	0.41	0.84	3.27	3.29	9.72	2.35	1.85	13.92	11.00	12.07	9.00	.....	.....	
0.61	1.60	0.47	1.43	4.11	4.10	9.36	2.10	0.92	12.38	11.00	11.46	9.00	.....	.....	
....	0.05	0.28	1.22	1.55	1.65	9.48	3.17	2.63	15.28	11.00	12.65	9.00	.....	.....	
....	2.14	0.50	1.61	4.25	4.12	7.52	2.49	2.36	12.37	11.00	10.01	10.00	.....	.....	
....	0.68	0.18	0.75	1.61	1.65	9.10	2.70	1.80	13.60	11.00	11.80	10.00	.....	.....	
....	1.84	0.43	0.94	3.21	3.29	6.48	2.09	1.78	10.35	9.00	8.57	8.00	.....	.....	
....	1.71	0.79	1.54	4.04	4.12	5.98	2.19	2.35	10.52	8.50	8.17	8.00	.....	.....	

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	S. M. Hess & Bro., Inc., Philadelphia, Pa.	
16507	Special Potato Manure, 1916 .....	Greenwich .....
16784	Fish and Potash Manure, 1916 .....	Lakewood .....
160133	Superior Superphosphate .....	Dayton .....
16786	High Grade Superphosphate .....	Lakewood .....
160224	Standard Superphosphate .....	Hopewell .....
	Thos. Hill, Flemington, N. J.	
160330	2-12 .....	Flemington .....
	P. Hoffman & Bro., Raubsville, Pa.	
160498	Potato and Truck Fertilizer .....	Phillipsburg .....
160499	Grain and Corn Fertilizer .....	Phillipsburg .....
	Hubbard Fertilizer Co., Baltimore, Md.	
16281	Hubbard's 5-10-0 Fertilizer .....	Daretown .....
16282	Hubbard's 4-10-0 Fertilizer .....	Daretown .....
160178	Hubbard's Excelsior Mixture .....	East Millstone .....
	H. H. Hutchinson, Jr., Robbinsville, N. J.	
160051	Hutchinson's Corn and Grain Fertilizer .....	Robbinsville .....
160052	Hutchinson's 4-8-2 Potato Fertilizer .....	Robbinsville .....
	International Seed Co., Rochester, N. Y.	
16156	International Grain Fertilizer .....	Salem .....
16157	International Crop Grower .....	Salem .....
16597	International General Phosphate .....	Swedesboro .....
160577	International Special Manure .....	Brookdale .....
160578	International Potato and Truck Manure No. 2 .....	Brookdale .....
	H. B. Kemp, Long Branch, N. J.	
16801	Kemp's Potato and Vegetable Fertilizer .....	Long Branch .....
16802	Kemp's Corn and Truck Fertilizer .....	Long Branch .....
16803	Kemp's Early Truck Grower .....	Long Branch .....
	Keystone Bone Fertilizer Co., Philadelphia, Pa.	
16283	Keystone Special Corn Fertilizer .....	Perrinesville .....
16284	Keystone Champion Potato Manure .....	Perrinesville .....
16346	1916 Keystone Sweet Potato Manure .....	Elm .....
16348	1916 Keystone Extra Potato Manure .....	Elm .....
16350	1916 Keystone Royal Corn and Potato Manure .....	Elm .....
160380	1916 Keystone Grain and Grass Manure .....	Ringoes .....
16347	1916 Keystone High Grade Truck Guano .....	Elm .....
160381	1916 Keystone Ammoniated Superphosphate .....	Ringoes .....

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.						POTASH.		
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.
											Found.	Guaranteed.		
0.55	1.52	0.34	1.22	3.63	3.70	4.90	3.95	1.08	9.93	9.00	8.85	8.00	0.92	1.00
Tr.	0.60	0.24	0.70	1.54	1.65	6.46	3.93	1.32	11.71	10.00	10.39	9.00	0.93	1.00
....	0.45	0.54	0.47	1.46	1.65	6.66	4.02	1.72	12.40	11.00	10.68	10.00	....	....
....	1.93	0.57	0.86	3.36	3.29	8.64	2.14	1.55	12.33	11.00	10.78	10.00	....	....
....	0.12	0.27	<sup>1</sup> 0.45	0.84	0.82	6.16	4.13	1.09	11.38	11.00	10.29	10.00	....	....
....	0.24	0.30	<sup>2</sup> 1.01	1.55	1.65	8.74	3.84	2.85	15.43	13.00	12.58	12.00	....	....
....	0.06	0.40	0.77	1.23	0.82	1.98	4.74	5.89	12.61	10.00	6.72	7.00	0.64	3.00
....	0.06	0.35	0.86	1.27	0.82	1.88	4.74	6.08	12.70	10.00	6.62	7.00	0.56	1.00
....	2.28	0.32	1.00	3.60	4.10	9.26	1.48	0.59	11.33	11.00	10.74	10.00	....	....
....	2.26	0.31	<sup>3</sup> 0.97	3.54	3.28	9.16	1.23	0.59	10.98	11.00	10.39	10.00	....	....
....	0.16	0.53	<sup>4</sup> 1.30	1.99	1.64	7.72	2.12	1.07	10.91	11.00	9.84	10.00	....	....
....	0.80	0.31	0.54	1.65	1.65	2.62	5.09	2.17	9.88	8.50	7.71	8.00	3.49	3.00
....	1.51	0.53	1.08	3.12	3.29	4.46	3.33	1.89	9.68	8.50	7.79	8.00	1.92	2.00
Tr.	0.09	0.39	0.53	1.01	0.82	5.74	4.98	1.29	12.01	11.00	10.72	10.00	0.86	1.00
....	0.16	0.55	0.32	1.03	0.82	4.54	5.38	1.41	11.33	11.00	9.92	10.00	....	....
....	0.47	0.67	0.55	1.69	1.65	5.24	4.82	1.37	11.43	11.00	10.06	10.00	....	....
0.30	0.44	0.49	0.57	1.80	1.65	7.24	3.58	1.28	12.10	11.00	10.82	10.00	0.88	1.00
....	0.23	0.88	0.60	1.71	1.65	6.36	3.65	1.51	11.52	11.00	10.01	10.00	2.99	3.00
....	1.37	0.21	1.62	3.20	3.29	6.28	3.68	1.41	11.37	10.50	9.96	10.00	....	....
....	0.52	0.37	1.25	2.14	2.47	7.54	3.15	1.41	12.10	10.50	10.69	10.00	....	....
....	1.39	0.31	2.26	3.96	4.11	4.94	4.82	2.08	11.84	10.50	9.76	10.00	....	....
....	0.14	1.06	1.26	2.46	2.46	1.88	6.36	3.43	11.67	12.00	8.24	10.00	....	....
Tr.	1.01	1.37	0.65	3.03	3.28	4.18	5.51	2.05	11.74	12.00	9.69	10.00	1.52	2.00
....	0.09	0.73	<sup>5</sup> 0.81	1.63	1.65	5.78	2.12	1.48	9.38	9.00	7.90	8.00	2.18	2.00
....	0.86	0.91	<sup>6</sup> 0.65	2.42	2.46	5.04	3.46	1.56	10.06	9.00	8.50	8.00	1.58	2.00
....	0.95	1.10	0.81	2.86	1.65	5.12	3.79	1.59	10.50	12.00	8.91	10.00	0.80	1.00
....	0.06	0.26	<sup>7</sup> 0.52	0.84	0.82	2.36	5.27	1.46	9.09	8.00	7.63	7.00	0.96	1.00
Tr.	1.34	1.00	1.12	3.46	4.10	4.74	3.97	1.79	10.50	9.00	8.71	8.00	....	....
Tr.	0.41	0.47	0.73	1.61	1.65	7.02	3.63	1.25	11.90	12.00	10.65	10.00	....	....

<sup>1</sup> Inferior quality. Activity 49%.

<sup>2</sup> Inferior quality. Activity 47%.

<sup>3</sup> Inferior quality. Activity 48%.

<sup>4</sup> Inferior quality. Activity 39%.

<sup>5</sup> Inferior quality. Activity 46%.

<sup>6</sup> Inferior quality. Activity 46%.

<sup>7</sup> Inferior quality. Activity 26%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	W. Lancaster, Philadelphia, Pa.	
16455	Grange B Brand Potato Manure .....	Roadstown .....
16397	Grange C Brand Potato Manure .....	Bridgeton .....
16398	Grange A Brand Potato Manure .....	Bridgeton .....
	C. A. Lippincott & Bro., Moorestown, N. J.	
16748	H. G. Fertilizer for Potatoes and General Use, without Potash, 1916 .....	Moorestown .....
	Listers Agricultural Chemical Works, Newark, N. J.	
16080	Listers Perfect Potato Manure, 1916 .....	Freehold .....
16081	Listers Superior Ammoniated Superphosphate, 1916 .....	Freehold .....
160312 <sup>1</sup>	Listers Superior Ammoniated Superphosphate, 1916 .....	New Germantown ...
160002	Listers Crescent Ammoniated Superphosphate, 1916 .....	Red Bank .....
16818	Listers Special Potato Fertilizer, 1916 .....	Belmar .....
	Locke & Black, Swedesboro, N. J.	
16596	Atkinson's No. 1 H. G. Potato, Onion and Early Truck Fertilizer, without Potash .....	Swedesboro .....
16419	Atkinson's No. 5 Special Early Tomato and Asparagus Grower .....	Asbury Station .....
162251	Atkinson's No. 5 Special Early Tomato and Asparagus Grower .....	Clayton .....
16251	Atkinson's No. 3 Special Sweet Potato Fertilizer, without Potash .....	Williamstown .....
16369	Atkinson's No. 6 All Around Fertilizer, without Potash .....	Salem .....
	Mapes F. and P. Guano Co., New York City.	
160500	Mapes' Top Dresser—Full Strength (War Brand) .....	Morristown .....
16652	Mapes' General Special (War Brand) .....	Hammonton .....
16653	Mapes' Corn Manure (War Brand) .....	Hammonton .....
16654	Mapes' Potato Manure (War Brand) .....	Hammonton .....
160502	Mapes' Cereal Brand (War Special) .....	Morristown .....
160569	Mapes' Top Dresser—Half Strength (War Brand) .....	Newark .....
160597	Mapes' General Crop (War Special) .....	Newton .....
	Martin Fertilizer Co., Philadelphia, Pa.	
16515	Martin's 4-8-1 .....	Gloucester .....
16514	Martin's 2-8-1 .....	Gloucester .....
160098	Martin's 4-8 .....	Hightstown .....
16248	Martin's 1¼-10 .....	Richwood .....
16619	Martin's 2-12 .....	Swedesboro .....
16620	Martin's 2-8 .....	Swedesboro .....
160240	Martin's 3-8 .....	Skillman .....

<sup>1</sup> Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.								POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.	
											Found.	Guaranteed.			
...	1.49	1.14	<sup>1</sup> 1.00	3.63	4.11	4.74	4.16	2.58	11.48	11.00	8.90	10.00	....	....	
...	1.10	1.05	0.87	3.02	2.46	7.18	3.10	1.75	12.03	11.00	10.28	10.00	....	....	
...	1.25	1.33	0.77	3.35	3.30	3.00	5.49	2.16	10.65	9.00	8.49	8.00	1.74	2.00	
...	2.41	0.35	1.05	3.81	4.12	9.16	1.68	1.20	12.04	10.00	10.84	10.00	....	....	
1.04	1.76	0.18	0.25	3.23	3.29	6.20	2.85	0.87	9.92	10.00	9.05	9.00	0.96	1.00	
0.91	0.99	0.51	1.00	3.41	3.29	4.96	4.12	3.39	12.47	11.00	9.08	10.00	....	....	
1.05	0.19	0.90	1.44	3.58	3.29	6.28	3.36	2.33	11.97	11.00	9.64	10.00	....	....	
...	0.58	0.37	0.85	1.80	1.65	6.34	3.64	2.80	12.78	11.00	9.98	10.00	....	....	
1.06	1.33	0.68	0.97	4.04	4.11	1.34	8.85	3.59	13.78	11.00	10.19	10.00	....	....	
0.71	1.28	0.53	<sup>2</sup> 1.07	3.59	3.70	6.10	2.50	1.79	10.39	9.00	8.60	8.00	....	....	
2.00	0.64	0.26	<sup>3</sup> 0.81	3.71	4.32	5.78	2.45	1.96	10.19	9.00	8.23	8.00	....	....	
2.25	0.69	0.59	<sup>4</sup> 0.92	4.45	4.32	6.40	1.93	1.66	9.99	9.00	8.33	8.00	....	....	
...	0.15	0.31	1.02	1.48	1.65	6.10	2.62	1.62	10.34	9.00	8.72	8.00	....	....	
...	0.12	0.34	<sup>5</sup> 1.51	1.97	2.06	5.50	1.88	2.24	9.62	8.00	7.38	7.00	....	....	
7.63	0.09	0.53	1.45	9.70	9.88	0.16	4.95	3.49	8.60	8.00	5.11	5.00	1.52	1.00	
5.42	....	0.05	<sup>6</sup> 1.28	6.75	5.76	0.90	4.58	3.24	8.72	8.00	5.48	6.00	1.85	1.00	
1.63	0.02	0.13	<sup>7</sup> 0.89	2.67	2.47	Tr.	7.59	3.76	11.35	10.00	7.59	8.00	1.08	1.00	
2.74	0.02	0.21	<sup>8</sup> 0.83	3.80	3.71	Tr.	8.20	2.09	10.29	8.00	8.20	8.00	1.32	1.00	
2.16	....	....	<sup>9</sup> 0.64	2.80	2.47	0.60	4.30	4.55	9.45	8.00	4.90	6.00	....	....	
4.40	....	0.22	<sup>10</sup> 0.68	5.30	4.94	Tr.	2.36	2.00	4.36	4.00	2.36	2.50	....	....	
1.07	....	0.13	<sup>11</sup> 0.71	1.91	1.65	1.14	6.27	4.06	11.47	10.00	7.41	8.00	....	....	
...	1.75	0.45	0.87	3.07	3.30	5.40	2.55	2.91	10.86	9.00	7.95	8.00	1.16	1.00	
...	1.17	0.16	<sup>12</sup> 0.67	2.00	1.65	2.60	3.63	3.30	9.53	9.00	6.23	8.00	0.78	1.00	
...	1.84	0.61	0.88	3.33	3.30	6.88	2.67	2.00	11.55	9.00	9.55	8.00	....	....	
...	0.17	0.29	<sup>13</sup> 0.68	1.14	1.03	7.08	3.14	1.27	11.49	11.00	10.22	10.00	....	....	
...	0.53	0.54	<sup>14</sup> 0.67	1.74	1.65	6.96	2.58	2.03	11.57	13.00	9.54	12.00	....	....	
...	0.51	0.62	<sup>15</sup> 0.80	1.93	1.65	6.30	2.37	2.35	11.02	9.00	8.67	8.00	....	....	
...	1.96	0.50	0.99	3.45	2.47	6.68	2.43	2.52	11.63	9.00	9.11	8.00	....	....	

<sup>1</sup> Inferior quality. Activity 48%.<sup>2</sup> Inferior quality. Activity 48%.<sup>3</sup> Inferior quality. Activity 43%.<sup>4</sup> Inferior quality. Activity 43%.<sup>5</sup> Inferior quality. Activity 49%.<sup>6</sup> Inferior quality. Activity 49%.<sup>7</sup> Inferior quality. Activity 44%.<sup>8</sup> Inferior quality. Activity 41%.<sup>9</sup> Inferior quality. Activity 42%.<sup>10</sup> Inferior quality. Activity 49%.<sup>11</sup> Inferior quality. Activity 41%.<sup>12</sup> Inferior quality. Activity 47%.<sup>13</sup> Inferior quality. Activity 45%.<sup>14</sup> Inferior quality. Activity 48%.<sup>15</sup> Inferior quality. Activity 45%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Middlesex Fertilizer Co., Plainfield, N. J.	
160519	Glaser's Potato and Vegetable Fertilizer .....	Scotch Plains .....
160520	Glaser's Complete for All Crops .....	Scotch Plains .....
160521	Glaser's Fertilizer for Corn and Oats .....	Scotch Plains .....
	Mitchell Fertilizer Co., Tremley, N. J.	
160530	Mitchell's Special Vegetable Fertilizer, 1916 .....	Elizabeth .....
160531	Mitchell's Special Lawn Dressing, 1916 .....	Elizabeth .....
	Monmouth County Farmers' Exchange, Freehold, N. J.	
16100	Triangle Brand 4-10-2 .....	Freehold .....
16067	Triangle Brand 4-10-0 .....	Marlboro .....
160079	Triangle Brand 1-11-2 .....	Marlboro .....
160089	Triangle Brand 8-6-0 .....	Freehold .....
	Jos. R. Moore, Swedesboro, N. J.	
16530	J. R. Moore's Best Early Tomato and Asparagus Manure....	Mullica Hill .....
16467	J. R. Moore's Gold Edge Sweet Potato Manure .....	Thorofare .....
16559	J. R. Moore's High Grade Early Truck and Potato Manure..	Swedesboro .....
16598	J. R. Moore's 2-8-1 Sweet Potato Manure .....	Swedesboro .....
16624	J. R. Moore's Baxter Tomato Guano .....	Swedesboro .....
16592	J. R. Moore's No Potash Sweet Potato Manure .....	Swedesboro .....
16924	J. R. Moore's 4-8-0 No Potash Manure .....	Swedesboro .....
	Nassau Fertilizer Co., New York City.	
16296	Nassau Special, 1916 .....	Atco .....
160207	General Favorite, 1916 .....	Bound Brook .....
160208	Potato Manure, 1916 .....	Bound Brook .....
	Albert Nelson, Allentown, N. J.	
160108	Nelson's Superior Potato Grower .....	Windsor .....
160110	Nelson's Special Potato Grower .....	Windsor .....
160112	Nelson's Special Corn Guano .....	Windsor .....
160107	Nelson's Special Fish and Potash .....	Windsor .....
160109	Nelson's Superior Potato Guano .....	Windsor .....
160111	Nelson's Special Potato Fertilizer .....	Windsor .....
	J. F. Noll & Co., Inc., Newark, N. J.	
160564	Noll's Garden Fertilizer (War Brand) .....	Newark .....
160567	Noll's Perfection Lawn Dressing (War Brand) .....	Newark .....
	Patapsco Guano Co., Baltimore, Md.	
160139	Patapsco Prize Crop Compound .....	Dayton .....
16988	Patapsco Truckers' Delight .....	Red Bank .....
160138	Patapsco Golden Crop Fertilizer, 1916 .....	Dayton .....
160127	Patapsco Fish Guano, 1916 .....	Dayton .....
160412	Patapsco Money Maker, 1916 .....	Frenchtown .....

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.								POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.	
											Found.	Guaranteed.			
0.88	0.16	0.32	1.86	3.22	3.29	7.06	2.21	1.91	11.18	8.00	9.27	6.00	.....	.....	
0.65	0.14	0.21	1.39	2.39	2.46	9.02	1.94	1.63	12.59	10.00	10.96	8.00	.....	.....	
....	0.62	0.19	0.88	1.69	1.65	7.80	3.17	4.71	15.68	12.00	10.97	8.00	.....	.....	
....	0.92	0.84	0.85	2.61	2.47	5.44	3.61	1.63	10.68	10.00	9.05	9.00	1.05	1.00	
....	0.80	0.96	0.76	2.52	2.47	5.54	4.40	1.15	11.09	10.00	9.94	9.00	1.06	1.00	
1.24	1.08	0.31	0.60	3.23	3.29	8.40	2.32	1.43	12.15	11.00	10.72	10.00	2.40	2.00	
1.23	1.02	0.39	0.85	3.49	3.29	8.70	2.86	2.37	13.93	11.00	11.56	10.00	.....	.....	
....	0.08	0.36	0.89	1.33	0.82	6.66	4.28	3.70	14.64	12.00	10.94	11.00	2.18	2.00	
5.52	0.06	0.24	0.78	6.60	6.58	3.86	3.38	2.21	9.45	7.00	7.24	6.00	.....	.....	
...	3.10	0.63	1.05	4.78	4.94	3.04	4.55	0.78	8.37	8.00	7.59	7.00	2.12	2.00	
...	0.34	0.63	0.70	1.67	1.65	3.80	4.80	0.60	9.20	9.00	8.60	8.00	3.36	3.00	
0.25	2.03	0.37	<sup>1</sup> 0.53	3.18	3.29	2.34	6.61	1.05	10.00	9.00	8.95	8.00	2.08	2.00	
....	0.09	0.72	<sup>2</sup> 0.79	1.60	1.65	2.26	6.28	1.11	9.65	9.00	8.54	8.00	1.08	1.00	
0.17	1.67	0.59	1.01	3.44	3.70	1.80	6.07	0.98	8.85	8.00	7.87	7.00	0.97	1.00	
....	0.10	0.68	<sup>3</sup> 0.69	1.47	1.65	4.00	3.85	1.51	9.36	9.00	7.85	8.00	.....	.....	
....	1.29	0.73	1.35	3.37	3.29	5.80	2.18	0.64	8.62	9.00	7.98	8.00	.....	.....	
....	1.06	0.48	0.76	2.30	2.47	5.58	4.33	1.10	11.01	10.00	9.91	9.00	0.93	1.00	
....	0.30	0.52	0.49	1.31	1.23	7.30	3.52	1.81	12.63	11.00	10.82	10.00	0.96	1.00	
....	0.73	0.42	0.71	1.86	2.06	5.36	3.21	1.95	10.52	9.00	8.57	8.00	1.02	1.00	
....	2.46	0.28	1.52	4.26	4.12	6.38	1.82	2.25	10.45	9.00	8.20	8.00	.....	.....	
....	1.89	0.29	1.23	3.41	3.29	5.16	1.88	2.28	9.32	9.00	7.04	8.00	.....	.....	
....	0.56	0.31	1.01	1.88	1.65	9.92	2.44	3.21	15.57	11.00	12.36	10.00	.....	.....	
....	0.70	0.39	0.58	1.67	1.65	6.94	2.30	1.56	10.80	9.50	9.24	8.50	1.04	1.00	
0.62	2.80	0.20	0.47	4.09	4.12	7.30	1.79	1.21	10.30	9.00	9.09	8.00	2.18	2.00	
....	2.57	0.20	<sup>4</sup> 0.40	3.17	3.29	6.94	1.83	1.27	10.04	9.00	8.77	8.00	2.22	2.00	
1.14	.....	0.03	<sup>5</sup> 0.71	1.88	1.65	1.12	6.15	4.46	11.73	10.00	7.27	8.00	.....	.....	
1.49	0.11	0.25	0.82	2.67	2.47	Tr.	7.79	4.33	12.12	10.00	7.79	8.00	1.13	1.00	
....	0.93	1.11	1.03	3.07	3.29	8.12	2.72	1.00	11.84	11.00	10.84	10.00	.....	.....	
0.53	0.15	0.43	0.92	2.03	2.47	7.00	4.04	1.00	12.04	11.00	11.04	10.00	.....	.....	
0.26	0.50	0.65	0.52	1.93	1.65	7.32	3.39	1.00	11.71	11.00	10.71	10.00	.....	.....	
....	0.18	0.75	0.42	1.35	1.23	7.56	3.48	1.41	12.45	11.00	11.04	10.00	*0.80	1.00	
....	0.18	0.59	0.35	1.12	0.82	5.52	3.73	1.32	10.57	9.00	9.25	8.00	*0.74	1.00	

\*Potash largely, if not entirely, from sulphate.

<sup>1</sup> Inferior quality. Activity 42%.

<sup>2</sup> Inferior quality. Activity 43%.

<sup>3</sup> Inferior quality. Activity 48%.

<sup>4</sup> Inferior quality. Activity 47%.

<sup>5</sup> Inferior quality. Activity 40%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Philadelphia Guano Works, Philadelphia, Pa.	
160182	1916 Corn and Vegetable Manure .....	Belle Mead .....
160183	1916 A Brand for Potatoes and Truck .....	Belle Mead .....
160184	1916 B Brand for Potatoes and Truck .....	Belle Mead .....
160214	<sup>1</sup> Oats and Grain Manure .....	Bound Brook .....
160216	1916 High Grade Potato Manure .....	Bound Brook .....
160217	Wheat and Grass Grower, 1916 .....	Bound Brook .....
	Rasin-Monumental Co., Baltimore, Md.	
16609	Rasin's Special Potato and Truck Fertilizer .....	Vineland .....
16610	Rasin's Truck and Vegetable Special .....	Vineland .....
16882	Rasin's Truck Ammoniated Superphosphate .....	Vineland .....
160433	Rasin's Special Fish Guano .....	Neshanic .....
16434	Rasin's Potato and Vegetable Ammoniated Superphosphate...	Bridgeton .....
16830	Rasin's Potato and Truck Ammoniated Superphosphate.....	Evesboro .....
	Reading Bone Fertilizer Co., Reading, Pa.	
16142	High Grade Truck Food .....	Merchantville .....
16914	Reading All Crop Special .....	Lewistown .....
16917	Reading Sterling Potato Grower .....	Pemberton .....
16762	6 and 12 (Special Mixture) .....	Bridgeboro .....
	R. A. Reichard, Allentown, Pa.	
160458	Gilt Edge Phosphate .....	Delaware .....
	Ellwood Roberts Co., Philadelphia, Pa.	
16728	<sup>1</sup> Roberts' Potato Goods .....	Winslow .....
16726	Roberts' Berry Goods .....	Winslow .....
16727	Roberts' Corn Goods .....	Winslow .....
	F. S. Royster Guano Co., Baltimore, Md.	
16082	Royster's Landmark Ammoniated Superphosphate .....	Freehold .....
16367	Royster's Abundant Ammoniated Superphosphate .....	Alloway .....
160384	Royster's Flamingo Ammoniated Superphosphate .....	Ringoes .....
16433	Royster's Big Bet Fertilizer .....	Bridgeton .....
160438	<sup>2</sup> Royster's Big Bet Fertilizer .....	Belvidere .....
16679	Royster's Goodwill Ammoniated Superphosphate .....	Bridgeport .....
16899	<sup>2</sup> Royster's Goodwill Ammoniated Superphosphate .....	Matawan .....
160019	Royster's Continental Fertilizer .....	Freehold .....
16572	Royster's Safe Guard Fertilizer .....	Vineland .....
16678	Royster's Penguin Ammoniated Superphosphate .....	Bridgeport .....
16834	Royster's Emergency Fertilizer .....	Hamilton Square .....

<sup>1</sup> 1915 Shipment.<sup>2</sup> Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.						POTASH.		
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.
											Found.	Guaranteed.		
0.46	0.14	0.40	<sup>1</sup> 0.66	1.66	1.64	9.08	2.09	0.92	12.09	11.00	11.17	10.00	.....	.....
0.59	1.46	0.37	0.71	3.13	3.30	8.30	2.25	0.92	11.47	11.00	10.55	10.00	.....	.....
....	1.49	0.54	<sup>2</sup> 0.54	2.57	2.46	9.32	1.89	0.47	11.68	11.00	11.21	10.00	.....	.....
....	0.10	0.52	<sup>3</sup> 0.33	0.95	0.82	2.42	5.38	2.18	9.98	8.00	7.80	7.00	0.91	1.00
....	1.21	1.12	<sup>4</sup> 0.94	3.27	3.30	3.92	4.13	1.98	10.03	9.00	8.05	8.00	1.00	1.00
....	0.12	0.10	<sup>5</sup> 0.62	0.84	0.82	2.92	7.01	1.49	11.42	10.00	9.93	9.00	.....	.....
0.16	2.43	0.19	0.43	3.21	3.29	8.50	2.13	1.27	11.90	11.00	10.63	10.00	1.80	2.00
0.29	2.85	0.25	0.57	3.96	4.12	7.64	1.23	1.35	10.22	9.00	8.87	8.00	2.05	2.00
....	3.20	0.30	0.79	4.29	4.12	6.10	2.11	1.83	10.04	9.00	8.21	8.00	.....	.....
....	0.71	0.16	0.51	1.38	1.65	9.08	2.70	2.06	13.84	12.00	11.78	11.00	.....	.....
....	1.77	0.39	1.22	3.38	3.29	5.12	2.10	2.26	9.48	9.00	7.22	8.00	.....	.....
....	1.62	0.37	1.01	3.00	3.29	7.92	2.43	1.96	12.31	11.00	10.35	10.00	.....	.....
....	1.68	0.80	0.56	3.04	3.29	9.46	3.29	2.17	14.92	13.00	12.75	12.00	.....	.....
....	0.57	0.64	0.31	1.52	1.64	5.34	3.77	3.03	12.14	11.00	9.11	10.00	.....	.....
....	1.71	0.56	0.56	2.83	3.29	3.84	3.85	2.35	10.04	9.00	7.69	8.00	.....	.....
....	4.71	0.01	0.18	4.90	4.94	8.44	2.88	1.71	13.03	13.00	11.32	12.00	.....	.....
....	0.06	0.13	0.54	0.73	0.82	1.30	7.26	0.76	9.32	9.00	8.56	8.00	1.38	1.50
0.72	1.13	0.19	<sup>6</sup> 0.83	2.87	3.28	4.00	3.92	1.23	9.15	8.00	7.92	8.00	1.51	1.00
0.28	2.17	0.03	0.80	3.28	3.28	5.34	2.58	0.89	8.81	8.00	7.92	8.00	.....	.....
....	1.29	0.16	<sup>7</sup> 0.70	2.15	1.64	6.40	2.32	1.38	10.10	8.00	8.72	8.00	.....	.....
....	1.16	0.47	1.27	2.90	3.29	7.24	2.47	2.79	12.50	10.50	9.71	10.00	.....	.....
....	1.71	0.78	1.19	3.68	4.11	7.56	2.85	2.59	13.00	10.50	10.41	10.00	.....	.....
....	1.05	0.27	<sup>8</sup> 0.66	1.98	2.06	7.86	3.88	2.47	14.21	12.50	11.74	12.00	.....	.....
....	1.30	0.73	1.04	3.07	3.29	4.48	3.42	1.75	9.65	8.50	7.90	8.00	*2.24	2.00
....	1.29	0.34	1.16	2.79	3.29	3.66	3.67	2.67	10.00	8.50	7.33	8.00	2.10	2.00
....	1.53	0.66	1.51	3.70	4.11	5.68	2.74	2.92	11.34	8.50	8.42	8.00	.....	.....
....	1.70	0.68	1.72	4.10	4.11	4.76	2.71	3.38	10.85	8.50	7.47	8.00	.....	.....
....	0.74	0.58	1.24	2.56	2.47	3.36	4.34	2.45	10.15	8.50	7.70	8.00	1.85	2.00
....	0.45	0.45	1.01	1.91	2.06	4.30	3.75	1.36	9.41	8.50	8.05	8.00	1.87	2.00
....	0.48	0.43	0.64	1.55	1.65	7.96	2.90	1.19	12.05	10.50	10.86	10.00	.....	.....
....	1.93	0.65	1.37	3.95	4.11	4.90	2.87	2.53	10.30	8.50	7.77	8.00	2.06	2.00

\*Potash largely, if not entirely, from sulphate.

<sup>1</sup> Inferior quality. Activity 42%.

<sup>2</sup> Inferior quality. Activity 46%.

<sup>3</sup> Inferior quality. Activity 41%.

<sup>4</sup> Inferior quality. Activity 48%.

<sup>5</sup> Inferior quality. Activity 38%.

<sup>6</sup> Inferior quality. Activity 44%.

<sup>7</sup> Inferior quality. Activity 41%.

<sup>8</sup> Inferior quality. Activity 47%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Schanck, Hutchinson & Field, Hightstown, N. J.	
16287	Special Fish Mixture for Potatoes, with 2% Potash .....	Hightstown .....
16288	Davison's Fish and Potash Mixture for Potatoes, 3% Potash.	Hightstown .....
160094	S. H. & F. Fish Mixture for Corn .....	Hightstown .....
160095	S. H. & F. Potato and Truck Manure .....	Hightstown .....
160104	S. H. & F. Crop Compound for Corn .....	Hightstown .....
	Scott Fertilizer Co., Elkton, Md.	
16202	Scott's Potato Grower, 1916 .....	Mt. Ephraim .....
16203	Scott's Sure Growth Compound, 1916 .....	Mt. Ephraim .....
160409	Scott's Ammoniated Superphosphate .....	Baptistown .....
16669	Scott's Ammoniated Base .....	Swedesboro .....
16168	W. R. Hackett's Special Potato Manure .....	Quinton .....
16457	W. R. Hackett's Top Dresser .....	Shiloh .....
16458	W. R. Hackett's Broadcaster .....	Shiloh .....
	M. L. Shoemaker & Co., Ltd., Philadelphia, Pa.	
160475	Swift-Sure Guano for Tomatoes, Truck and Corn .....	Paterson .....
16122	Swift-Sure Superphosphate for Tobacco and General Use....	Moorestown .....
	Harry L. Sickel, Woodbury, N. J.	
16481	Well's 1916 I Brand Extra Early Potato Manure .....	Thorofare .....
16482	Well's 1916 C Brand Highest Grade Prosperity Potato Manure	Thorofare .....
16673	Well's 1916 D Brand Highest Grade General Use Fish Guano	Repaupo .....
16675	Well's 1916 A Brand Highest Grade Potato Manure .....	Repaupo .....
16674	Well's-Sickel 1916 B Brand Highest Grade Sweet Potato Manure .....	Repaupo .....
16848	Well's-Sickel 1916 I Brand Extra Early Potato Manure.....	Marlton .....
16849	Well's-Sickel 1916 G Brand Truckers' Fish .....	Marlton .....
16966	Well's 1916 XX Pure Dissolved Animal Bone .....	Beverly .....
	South Jersey Farmers' Exchange, Woodstown, N. J.	
16308	A Square Brand H. G. Potato and Truck Fertilizer.....	Woodstown .....
16271	B 5% Square Brand H. G. Potato Fertilizer .....	Daretown .....
16313	B Square Brand H. G. Potato Fertilizer .....	Woodstown .....
16312	C Square Brand General Use and Truck Fertilizer .....	Woodstown .....
16529	<sup>1</sup> C Square Brand General Use and Truck Fertilizer .....	Mullica Hill .....
16314	D Square Brand Potato and Truck Fertilizer .....	Woodstown .....
16316	E Square Brand Sweet Potato and Truck Fertilizer .....	Woodstown .....
16315	F Square Brand Asparagus and Truck Fertilizer .....	Woodstown .....
16317	G Square Brand Early Tomato Fertilizer .....	Woodstown .....
16332	□ A Square Brand H. G. Potato and Truck Fertilizer.....	Woodstown .....
16878	<sup>1</sup> □ A Square Brand H. G. Potato and Truck Fertilizer.....	Cedarville .....

<sup>1</sup> Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.								POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.	
											Found.	Guaranteed.			
0.29	2.13	0.27	0.47	3.16	3.29	4.94	1.23	1.01	7.18	7.00	6.17	6.00	2.17	2.00	
....	2.71	0.22	0.56	3.49	3.28	6.36	1.64	1.72	9.72	9.00	8.00	8.00	2.99	3.00	
....	0.94	0.27	0.46	1.67	1.65	6.16	2.53	1.17	9.86	9.00	8.69	8.00	....	....	
....	1.40	0.37	1.11	2.88	3.29	5.98	2.00	1.57	9.55	9.00	7.98	8.00	....	....	
0.40	1.03	0.11	0.21	1.75	1.65	6.44	2.55	1.12	10.11	9.00	8.99	8.00	2.29	2.00	
....	0.38	0.57	0.80	1.75	1.65	8.84	2.93	1.95	13.72	11.00	11.77	10.00	1.47	1.00	
0.79	0.47	0.25	1.32	2.83	3.30	9.84	2.21	1.20	13.25	11.00	12.05	10.00	1.08	1.00	
....	1.04	0.53	1.54	3.11	3.30	8.60	3.15	2.65	14.40	11.00	11.75	10.00	....	....	
....	0.59	0.43	0.57	1.59	1.65	7.54	4.10	2.89	14.53	13.00	11.64	12.00	....	....	
0.78	1.48	0.95	1.55	4.76	4.95	7.14	3.00	1.92	12.06	12.00	10.14	11.00	....	....	
1.71	1.71	0.33	1.61	5.36	5.78	5.86	3.09	4.69	13.64	12.00	8.95	11.00	....	....	
....	0.12	0.65	1.98	2.75	2.46	6.14	3.55	7.49	17.18	17.00	9.69	16.00	....	....	
0.41	0.04	0.67	0.77	1.89	1.65	3.40	4.80	4.66	12.86	10.00	8.20	8.00	....	....	
0.79	0.02	0.98	1.37	3.16	3.29	5.18	4.67	3.06	12.91	12.00	9.85	9.00	....	....	
0.66	0.67	0.49	1.42	3.24	3.30	4.16	1.92	2.01	8.09	6.00	6.08	6.00	0.75	1.00	
....	0.92	0.30	0.65	1.87	1.85	5.50	3.08	2.21	10.79	7.00	8.58	7.00	0.79	1.00	
0.54	0.36	0.44	0.86	2.20	2.06	4.50	2.48	2.95	9.93	6.00	6.98	6.00	*1.21	1.00	
....	1.36	0.49	1.01	2.86	2.88	6.84	2.08	1.26	10.18	7.00	8.92	7.00	*1.02	1.00	
....	0.12	0.43	0.71	1.26	1.23	4.44	2.68	2.50	9.62	7.00	7.12	7.00	....	....	
0.65	0.57	0.59	1.34	3.15	3.30	3.82	2.69	1.84	8.35	6.00	6.51	6.00	....	....	
....	2.21	0.87	1.96	5.04	4.94	0.80	1.65	0.76	3.21	3.00	2.45	1.50	....	....	
....	0.56	0.57	0.97	2.10	2.06	1.82	11.99	1.46	15.27	14.00	13.81	13.00	....	....	
0.55	0.99	0.88	1.41	3.83	4.10	7.18	2.36	3.24	12.80	11.00	9.54	10.00	....	....	
0.62	0.53	0.78	1.23	3.16	3.25	5.86	2.47	2.45	10.78	9.00	8.33	8.00	5.37	5.00	
....	0.62	0.98	1.40	3.00	3.29	6.88	2.74	3.16	12.78	11.00	9.62	10.00	....	....	
0.17	0.33	0.47	1.46	2.43	2.46	7.56	2.87	2.39	12.82	11.00	10.43	10.00	....	....	
....	0.14	0.70	1.60	2.44	2.46	7.94	3.01	2.34	13.29	11.00	10.95	10.00	....	....	
0.21	0.70	0.66	2.08	3.65	3.29	4.14	4.31	3.31	11.76	9.00	8.45	8.00	1.74	2.00	
....	0.35	0.55	1.39	2.29	1.64	4.26	4.41	2.29	10.96	9.00	8.67	8.00	2.04	2.00	
1.23	1.44	0.43	1.61	4.71	4.95	7.06	1.25	1.76	10.07	9.00	8.31	8.00	....	....	
1.31	1.55	0.41	1.69	4.96	4.95	6.98	1.74	1.63	10.35	9.00	8.72	8.00	....	....	
0.86	0.22	0.34	2.76	4.18	4.11	5.32	4.38	2.52	12.22	11.00	9.70	10.00	....	....	
0.82	0.43	0.74	1.76	3.75	4.11	7.60	2.33	2.57	12.50	11.00	9.93	10.00	....	....	

\*Potash largely, if not entirely, from sulphate.

<sup>1</sup> Inferior quality. Activity 47%.

<sup>2</sup> Inferior quality. Activity 46%.

<sup>3</sup> Inferior quality. Activity 40%.

<sup>4</sup> Inferior quality. Activity 44%.

<sup>5</sup> Inferior quality. Activity 47%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	South Jersey Farmers' Exchange, Woodstown, N. J.—(Cont.)	
16333	□ B Square Brand H. G. Potato Fertilizer .....	Woodstown .....
16311	□ C Square Brand General Use and Truck Fertilizer.....	Woodstown .....
16503	1□ C Square Brand General Use and Truck Fertilizer.....	Fairton .....
16880	1□ C Square Brand General Use and Truck Fertilizer.....	Woodstown .....
16310	□ D Square Brand Potato and Truck Fertilizer .....	Woodstown .....
16309	□ E Square Brand Sweet Potato and Truck Fertilizer.....	Woodstown .....
16876	1□ E Square Brand Sweet Potato and Truck Fertilizer.....	Bridgeton .....
16307	□ F Square Brand Asparagus and Truck Fertilizer.....	Woodstown .....
16505	1□ F Square Brand Asparagus and Truck Fertilizer.....	Fairton .....
16879	1□ F Square Brand Asparagus and Truck Fertilizer.....	Cedarville .....
16334	<> A Square Brand H. G. Potato and Truck Fertilizer.....	Woodstown .....
16335	<> B Square Brand H. G. Potato Fertilizer .....	Woodstown .....
16336	<> C Square Brand General Use and Truck Fertilizer.....	Woodstown .....
16338	<> D Square Brand Potato and Truck Fertilizer.....	Woodstown .....
16337	<> E Square Brand Sweet Potato and Truck Fertilizer.....	Woodstown .....
	Standard Guano Co., Baltimore, Md.	
16240	Circle A Brand Special Grange Mixture .....	Mt. Ephraim .....
16195	Circle A Brand Ammoniated Special .....	Ashland .....
16929	Circle A Brand Superior Ammoniated ..	Lumberton .....
16436	Grange Commercial Store 5-8-0 Big Crop Grower .....	Bridgeton .....
16437	Grange Commercial Store 3-10-0 Farmers' Favorite .....	Bridgeton .....
16440	Grange Commercial Store 5-10-0 Royal Gem .....	Bridgeton .....
16852	Circle A Brand Grain Grower .....	Masonville .....
16438	Grange Commercial Store 4-8-2 Sure Crop .....	Bridgeton .....
16606	Grange Commercial Store 4-8-4 Royal Crop Grower.....	Millville .....
16925	Circle A Brand Truckers' Delight.....	Burlington .....
	Henry Stanley, Westville, N. J.	
16486	Sweet Potato Manure, 1916 .....	Thorofare .....
	Swift & Co., Baltimore, Md.	
160124	Swift's Pure Special Corn Grower .....	Jamesburg .....
16273	Swift's Pure Baltimore Formula .....	Elmer .....
16373	Swift's White Potato Special .....	Salem .....
160303	Swift's Pure Sweet Potato Special .....	Pittstown .....
16993	Swift's Pure Truck and Vegetable .....	Red Bank .....
160008	Swift's Special Harrison Formula .....	Colts Neck .....
16995	Swift's Special Pride of Jersey Fertilizer .....	Eatontown .....
16278	Swift's Mammoth Potato Brand .....	Daretown .....

† Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.						POTASH.		
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.
											Found.	Guaranteed.		
0.91	0.27	0.53	1.40	3.11	3.29	7.70	2.10	2.33	12.13	11.00	9.80	10.00	.....	.....
0.81	0.15	0.20	1.27	2.43	2.47	6.54	2.99	2.10	11.63	11.00	9.53	10.00	.....	.....
0.81	0.12	0.23	1.08	2.24	2.47	6.26	3.50	1.82	11.58	11.00	9.76	10.00	.....	.....
0.83	0.14	0.31	1.15	2.43	2.47	6.80	3.26	1.61	11.67	11.00	10.06	10.00	.....	.....
0.91	0.60	0.37	1.12	3.00	3.29	5.92	1.85	2.21	9.98	9.00	7.77	8.00	2.05	2.00
Tr.	0.16	0.47	0.82	1.45	1.65	6.22	1.33	1.62	9.17	9.00	7.55	8.00	1.92	2.00
Tr.	0.19	0.40	0.89	1.48	1.65	6.32	2.07	1.25	9.64	9.00	8.39	8.00	1.93	2.00
1.48	0.42	0.30	1.96	4.16	4.93	5.14	2.44	3.72	11.30	9.00	7.58	8.00	.....	.....
1.64	0.38	0.71	2.11	4.84	4.93	5.24	2.70	3.44	11.38	9.00	7.94	8.00	.....	.....
1.75	0.36	0.49	2.21	4.81	4.93	5.34	2.28	3.32	10.94	9.00	7.62	8.00	.....	.....
0.82	0.78	0.25	2.09	3.94	4.10	6.74	3.09	2.67	12.50	11.00	9.83	10.00	.....	.....
0.64	0.82	0.10	1.27	2.83	3.29	8.46	2.03	0.95	11.44	11.00	10.49	10.00	.....	.....
....	0.85	0.17	1.35	2.37	2.46	8.36	1.72	1.00	11.08	11.00	10.08	10.00	.....	.....
0.75	0.88	0.10	1.12	2.85	3.29	7.28	1.69	0.71	9.68	9.00	8.97	8.00	*1.88	2.00
....	0.27	0.57	0.72	1.56	1.64	3.96	4.48	1.39	9.83	9.00	8.44	8.00	1.59	2.00
....	2.23	0.39	<sup>1</sup> 0.58	3.20	3.28	9.40	1.69	0.50	11.59	10.50	11.09	10.00	.....	.....
0.25	1.43	0.25	1.31	3.24	3.28	5.12	3.50	1.21	9.83	9.50	8.62	7.00	.....	.....
....	1.80	0.16	<sup>2</sup> 1.16	3.12	3.28	8.00	0.70	0.76	9.46	8.50	8.70	8.00	.....	.....
....	1.82	0.23	2.29	4.34	4.10	7.22	1.22	0.44	8.88	8.50	8.44	8.00	.....	.....
....	1.44	0.50	0.89	2.83	2.46	6.94	1.98	1.15	10.07	10.50	8.92	10.00	.....	.....
....	2.66	0.13	1.25	4.04	4.10	9.46	1.19	0.45	11.00	10.50	10.65	10.00	.....	.....
....	1.15	0.14	<sup>3</sup> 0.43	1.72	1.64	5.78	3.60	1.18	10.56	8.50	9.38	8.00	2.80	2.00
....	1.82	0.26	1.09	3.17	3.28	6.42	2.64	1.39	10.45	8.50	9.06	8.00	2.36	2.00
....	1.82	0.18	1.03	3.03	3.28	4.44	4.20	1.56	10.20	8.50	8.64	8.00	4.12	4.00
....	0.50	0.14	0.45	1.09	2.46	7.80	2.16	0.77	10.73	6.50	9.96	6.00	1.70	5.00
....	0.69	0.52	0.55	1.76	1.65	6.04	4.65	1.09	11.78	11.00	10.69	10.00	0.79	1.00
....	0.33	0.31	<sup>4</sup> 0.99	1.63	1.65	6.60	3.04	1.62	11.26	10.00	9.64	10.00	.....	.....
0.68	0.56	0.37	1.57	3.18	3.29	6.40	2.99	1.89	11.28	10.00	9.39	10.00	1.20	1.00
0.63	0.49	0.47	1.67	3.26	3.29	2.64	4.50	2.51	9.65	8.00	7.14	8.00	1.12	1.00
0.15	0.27	0.13	0.61	1.16	1.65	4.78	2.49	1.03	8.30	8.00	7.27	8.00	0.73	1.00
....	0.44	0.25	0.57	1.26	1.65	5.08	2.83	1.00	8.91	8.00	7.91	8.00	0.86	1.00
....	0.03	0.15	<sup>5</sup> 0.66	0.84	3.29	6.68	3.86	1.22	11.76	10.00	10.54	10.00	.....	.....
Tr.	1.44	0.36	1.97	3.77	4.11	5.24	2.50	2.71	10.45	8.00	7.74	8.00	.....	.....
0.48	0.73	0.18	<sup>6</sup> 1.73	3.12	4.11	7.40	2.93	1.83	12.16	10.00	10.33	10.00	.....	.....

\*Potash largely, if not entirely, from sulphate.

<sup>1</sup> Inferior quality. Activity 37%.

<sup>2</sup> Inferior quality. Activity 47%.

<sup>3</sup> Inferior quality. Activity 38%.

<sup>4</sup> Inferior quality. Activity 41%.

<sup>5</sup> Inferior quality. Activity 46%.

<sup>6</sup> Inferior quality. Activity 31%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Swift & Co., Kearny, N. J.	
16285	Swift's Pure Harrison Formula Manure .....	Perrinesville .....
16363	Swift's Special Harrison Formula Fertilizer .....	Marlton .....
16147	Holly Favorite Fertilizer .....	Mt. Holly .....
160011	Swift's Pure Truck and Potato Fertilizer .....	Freehold .....
16361	Swift's Pure Top Dressing Formula No. 1 .....	Marlton .....
160067	Swift's Pure Corn Grower .....	Englishtown .....
160068	Burt's Potato Grower .....	Tennent .....
160210	Swift's Pure Farmers' Favorite Fertilizer .....	Martinsville .....
160260	Swift's Pure Special Potato Fertilizer .....	Millington .....
160082	Swift's Pure Special Pride of Jersey Fertilizer .....	Freehold .....
16857	Haines' Truck and Potato Fertilizer .....	Medford .....
16858	Haines' Special Pride of Jersey Fertilizer .....	Medford .....
16859	Haines' Special Harrison Formula Fertilizer .....	Medford .....
	Taylor Bros., Camden, N. J.	
16382	H. G. Potato Phosphate, 1916, Revised .....	Camden .....
16383	TB Superior Ammoniated Phosphate .....	Camden .....
	Taylor Provision Co., Trenton, N. J.	
160225	John Taylor's H. G. Corn and Truck Manure, Revised.....	Hopewell .....
160226	John Taylor's P. D. B. Revised .....	Hopewell .....
	I. P. Thomas & Son Co., Philadelphia, Pa.	
16111	Pea Fertilizer .....	Delanco .....
16943	Crude Fish Mixture .....	Riverton .....
16340	Sweet Potato Substitute .....	Swedesboro .....
16252	Fish Guano .....	Williamstown .....
16513	Thomas' Four Per Cent Organic Fertilizer .....	Westville .....
16219	Truckers' High Grade Manure .....	Glassboro .....
16463	2 Per Cent Potash Manure .....	Greenwich .....
16466	Champion Guano .....	Greenwich .....
16718	2 Per Cent Potash Sweet Potato Manure .....	Egg Harbor .....
	Trenton Bone Fertilizer Co., Trenton, N. J.	
160146	Sweet Potato and Corn .....	Prospect Plains .....
160192	4-8 Potato .....	Pennington .....
16774	5-8 Potato .....	Freehold .....
16775	4-10 Potato .....	Freehold .....
16956	Borden's Fish Mixture .....	Beverly .....
16960	Bone and Fish .....	Beverly .....
160228	Oats Mixture .....	Hopewell .....

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.						POTASH.		
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.
											Found.	Guaranteed.		
2.32	0.14	0.14	0.65	3.25	3.29	6.84	2.66	1.98	11.48	10.00	9.50	10.00	1.94	2.00
....	1.72	0.43	1.01	3.16	3.29	7.06	2.97	1.99	12.02	10.00	10.03	10.00	....	....
....	2.23	0.32	1.51	4.06	4.11	7.88	1.82	1.86	11.56	10.00	9.70	10.00	....	....
....	2.35	0.44	0.86	3.65	3.29	7.76	2.02	0.72	10.50	8.00	9.78	8.00	....	....
....	3.08	0.58	1.51	5.17	5.76	5.72	2.28	2.13	10.13	8.00	8.00	8.00	....	....
0.18	0.22	0.34	0.79	1.53	1.65	6.88	3.37	1.44	11.69	10.00	10.25	10.00	0.99	1.00
1.22	0.24	0.41	1.28	3.15	3.29	4.44	3.27	2.31	10.02	8.00	7.71	8.00	1.14	1.00
0.88	0.03	0.31	0.69	1.91	1.65	5.86	2.87	0.94	9.67	9.00	8.73	9.00	*1.00	1.00
1.37	0.07	0.24	0.61	2.29	1.65	5.14	3.91	1.67	10.72	8.00	9.05	8.00	1.38	1.00
....	2.64	0.56	1.10	4.30	4.11	7.22	1.84	0.98	10.04	8.00	9.06	8.00	....	....
....	1.99	0.24	1.22	3.45	3.29	6.68	1.88	1.46	10.02	8.00	8.56	8.00	....	....
....	2.57	0.31	1.42	4.30	4.11	7.06	1.85	1.59	10.50	8.00	8.91	8.00	....	....
....	2.14	0.20	1.24	3.58	3.29	8.56	2.02	1.73	12.31	10.00	10.58	10.00	....	....
Tr.	0.49	0.39	<sup>1</sup> 0.76	1.64	1.65	8.34	1.52	1.80	11.66	10.00	9.86	10.00	0.98	3.00
Tr.	0.49	0.35	<sup>2</sup> 0.68	1.52	1.65	7.18	3.80	1.65	12.63	8.00	10.98	8.00	0.99	1.00
0.18	1.45	0.37	<sup>3</sup> 0.69	2.69	2.46	8.70	1.95	1.15	11.80	11.00	10.65	10.00	....	....
....	0.05	0.53	<sup>4</sup> 0.90	1.48	1.64	7.76	3.52	1.17	12.45	11.00	11.28	10.00	....	....
....	1.23	0.32	1.16	2.71	2.88	3.82	2.34	1.51	7.67	6.50	6.16	6.00	....	....
....	0.46	0.90	1.76	3.12	3.70	7.16	2.39	2.55	12.10	.....	9.55	9.00	....	....
0.18	0.21	0.74	0.65	1.78	1.65	6.96	3.37	1.55	11.88	10.50	10.33	10.00	....	....
....	1.92	0.83	1.41	4.16	4.10	7.76	1.94	2.20	11.90	10.50	9.70	10.00	....	....
....	1.36	0.88	1.14	3.38	3.25	7.50	2.12	2.11	11.73	10.50	9.62	10.00	....	....
Tr.	1.22	0.75	0.96	2.93	3.25	5.36	2.60	1.73	9.69	8.50	7.96	8.00	1.12	1.00
0.15	1.14	0.60	1.12	3.01	3.25	4.64	4.19	1.97	10.80	8.50	8.83	8.00	1.59	2.00
....	0.26	0.81	0.64	1.71	1.65	3.92	4.15	2.20	10.27	8.50	8.07	8.00	1.04	1.00
....	0.63	0.40	0.70	1.73	1.65	5.56	3.71	1.84	11.11	8.50	9.27	8.00	2.06	2.00
0.45	0.54	0.20	0.47	1.66	1.64	8.42	2.27	0.45	11.14	11.00	10.69	10.00	....	....
1.11	0.76	0.43	0.80	3.10	3.28	8.10	1.93	1.58	11.61	9.00	10.03	8.00	....	....
1.16	1.02	0.55	1.11	3.84	4.10	7.58	2.43	1.48	11.49	9.00	10.01	8.00	....	....
1.28	0.95	0.28	0.57	3.08	3.28	9.06	1.97	0.75	11.78	11.00	11.03	10.00	....	....
....	1.82	0.65	1.47	3.94	4.10	4.76	1.64	1.32	7.72	6.00	6.40	5.00	....	....
....	0.33	1.07	3.26	4.66	6.15	Tr.	8.94	10.52	19.46	5.00	8.94	2.50	....	....
....	0.01	0.32	0.58	0.91	0.82	7.72	3.35	1.66	12.73	11.00	11.07	10.00	....	....

\*Potash largely, if not entirely, from sulphate.

<sup>1</sup> Inferior quality. Activity 43%.<sup>2</sup> Inferior quality. Activity 41%.<sup>3</sup> Inferior quality. Activity 46%.<sup>4</sup> Inferior quality. Activity 44%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Trenton Bone Fertilizer Co., Trenton, N. J.—(Cont.)	
160169	Special Mixture No. 92 .....	Pennington .....
160345	Special Grain .....	Lambertville .....
	F. W. Tunnell & Co., Inc., Philadelphia, Pa.	
16144	Fish and Truck Mixture .....	Moorestown .....
16054	<sup>1</sup> Fish and Truck Mixture .....	Edgewater Park .....
16452	<sup>1</sup> Fish and Truck Mixture .....	Cranbury .....
16143	1916 High Grade Potato Manure .....	Moorestown .....
16454	<sup>1</sup> 1916 High Grade Potato Manure .....	Cranbury .....
16064	1916 Jersey Potato Manure .....	Marlboro .....
16749	<sup>1</sup> 1916 Jersey Potato Manure .....	Delanco .....
16451	1916 No. 1 Potato and Truck Manure .....	Cranbury .....
16095	Monmouth's Pride Potato Manure .....	Freehold .....
16750	<sup>1</sup> Monmouth's Pride Potato Manure .....	Delanco .....
16751	1916 Ten Per Cent Guano .....	Collingswood .....
16764	<sup>1</sup> 1916 Ten Per Cent Guano .....	Delanco .....
16135	Long Island Trucker .....	Jamesburg .....
16701	<sup>1</sup> Long Island Trucker .....	Grenloch .....
16450	Lightning Guano, 1916 .....	Cranbury .....
16744	1916 Fish and Potato Manure .....	Collingswood .....
16453	Sweet Potato Manure, 1916 .....	Cranbury .....
160125	1916 Fish Manure .....	Jamesburg .....
16449	1916 No. 2 Potato and Truck Manure .....	Cranbury .....
16754	Truckers' Fish Manure .....	Collingswood .....
160033	Potato and Fish Guano .....	Beverly .....
160331	Grass Dresser .....	Mendham .....
	J. E. Tygert Co., Philadelphia, Pa.	
16059	Golden Harvest Phosphate, 1916 .....	Burlington .....
16060	Sweet Potato Guano, 1916 .....	Burlington .....
16522	Old Reliable Phosphate, 1916 .....	Mullica Hill .....
16525	Special Potato and Tomato Guano, 1916 .....	Mullica Hill .....
16061	Ammoniated Fertilizer AAA .....	Burlington .....
16062	Ammoniated Fertilizer AA .....	Burlington .....
16063	Ammoniated Fertilizer A .....	Burlington .....
16461	5-10-0 Fertilizer .....	Roadstown .....
16462	Great Advancer Phosphate, 1916 .....	Roadstown .....

<sup>1</sup> Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.								POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.	
											Found.	Guaranteed.			
1.67	0.04	0.23	0.79	2.73	2.87	11.10	1.76	1.79	14.65	12.00	12.86	11.00	.....	.....	
0.39	0.05	0.48	0.86	1.78	1.64	4.44	4.91	2.63	11.98	10.00	9.35	9.00	.....	.....	
0.19	1.62	1.09	<sup>1</sup> 1.01	3.91	4.12	2.02	4.64	1.81	8.47	7.00	6.66	6.00	.....	.....	
0.21	1.22	1.03	<sup>2</sup> 1.41	3.87	4.12	1.44	5.14	1.47	8.05	7.00	6.58	6.00	.....	.....	
...	1.45	1.94	1.04	4.43	4.12	5.40	3.34	2.39	11.13	7.00	8.74	6.00	.....	.....	
0.21	1.42	0.93	<sup>3</sup> 0.94	3.50	4.12	2.74	4.43	1.36	8.53	8.00	7.17	7.00	.....	.....	
...	1.66	1.26	1.02	3.94	4.12	1.56	4.94	2.36	8.86	8.00	6.50	7.00	.....	.....	
0.87	0.35	1.00	1.00	3.22	3.30	1.44	5.02	2.57	9.03	9.00	6.46	8.00	0.88	1.00	
...	1.04	1.22	0.75	3.01	3.30	4.62	5.55	1.60	11.77	9.00	10.17	8.00	1.36	1.00	
...	1.32	1.88	1.08	4.28	3.30	4.96	3.98	2.22	11.16	11.00	8.94	10.00	.....	.....	
...	1.11	1.25	1.00	3.36	3.30	1.34	4.77	3.84	9.95	9.00	6.11	8.00	1.72	2.00	
...	1.63	0.49	1.17	3.29	3.30	6.68	3.02	1.21	10.91	9.00	9.70	8.00	1.72	2.00	
0.73	3.85	1.90	1.31	7.79	8.23	0.42	4.64	0.84	5.90	5.00	5.06	4.00	.....	.....	
0.87	3.79	1.69	1.41	7.76	8.23	0.22	4.53	0.90	5.65	5.00	4.75	4.00	.....	.....	
...	1.38	1.41	0.80	3.59	4.12	6.54	3.18	1.73	11.45	11.00	9.72	10.00	.....	.....	
0.20	1.49	0.95	1.08	3.72	4.12	7.20	1.78	2.87	11.85	11.00	8.98	10.00	.....	.....	
...	1.50	1.82	1.10	4.42	4.12	5.12	3.52	2.42	11.06	9.00	8.64	8.00	.....	.....	
...	1.55	0.86	1.34	3.75	4.12	5.38	2.32	1.70	9.40	7.00	7.70	6.00	.....	.....	
...	1.55	0.86	0.76	3.17	1.64	2.94	4.81	2.55	10.30	9.00	7.75	8.00	1.78	2.00	
...	0.10	0.69	0.83	1.62	1.64	3.60	6.09	3.10	12.79	11.00	9.69	10.00	.....	.....	
...	1.41	1.03	1.07	3.51	2.46	5.04	3.99	2.54	11.57	11.00	9.03	10.00	.....	.....	
...	1.53	1.63	1.27	4.43	4.31	5.14	3.58	2.13	10.85	7.00	8.72	6.00	.....	.....	
...	1.62	1.68	1.04	4.34	4.12	5.76	3.28	2.11	11.15	6.75	9.04	5.75	.....	.....	
...	1.53	0.81	1.18	3.52	4.12	6.58	2.70	1.28	10.56	9.00	9.28	8.00	.....	.....	
...	0.11	0.44	0.30	0.85	0.82	2.96	4.75	1.38	9.09	9.00	7.71	8.00	0.77	1.00	
...	0.36	0.46	0.47	1.29	1.23	7.26	3.72	1.08	12.06	11.00	10.98	10.00	0.84	1.00	
...	0.75	0.59	0.69	2.03	2.06	5.00	3.99	0.99	9.98	9.00	8.99	8.00	0.86	1.00	
0.32	0.58	0.28	0.54	1.72	2.06	4.40	6.24	1.15	11.79	11.00	10.64	10.00	1.17	1.00	
0.25	0.82	0.53	0.79	2.39	2.47	6.94	4.28	2.04	13.26	11.00	11.22	10.00	.....	.....	
...	0.63	0.54	0.63	1.80	1.65	5.56	4.50	1.27	11.33	11.00	10.06	10.00	.....	.....	
0.18	0.29	0.45	0.41	1.33	0.82	4.20	5.78	1.08	11.06	11.00	9.98	10.00	.....	.....	
0.77	1.61	0.29	1.27	3.94	4.11	6.58	3.76	1.14	11.48	11.00	10.34	10.00	.....	.....	
0.65	0.83	0.52	1.26	3.26	3.29	4.30	5.63	1.97	11.90	11.00	9.93	10.00	.....	.....	

<sup>1</sup> Inferior quality. Activity 46%.<sup>2</sup> Inferior quality. Activity 47%.<sup>3</sup> Inferior quality. Activity 47%.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

Station Number.	MANUFACTURER AND BRAND.	WHERE SAMPLED.
	Virginia-Carolina Chemical Co., New York City.	
16084	V. C. C. Co.'s Double Owl Brand—Potato and Truck Fertilizer (with 2% Potash) .....	Freehold .....
16085	V. C. C. Co.'s Double Owl Brand—Potato and Truck Fertilizer (with 1% Potash) .....	Freehold .....
16286	C & B XXXX Fish and Potash Potato Manure (with 2% Potash) .....	Hightstown .....
16526	V. C. C. Co.'s Early Truckers' Special (with 1% Potash)....	Mullica Hill .....
16871	V. C. C. Co.'s 20th Century Potato Manure (with 2% Potash)	Keyport .....
16979	V. C. C. Co.'s XXX Fish and Potash Mixture .....	Red Bank .....
160044	V. C. C. Co.'s Plow Brand Fertilizer .....	Yardville .....
	A. J. Vreeland, Matawan, N. J.	
16905	Vreeland's Revised Truck Guano .....	Matawan .....
	J. Wenderoth & Sons, Camden, N. J.	
16182	2-8 Fertilizer .....	Camden .....
16183	4-8 Fertilizer .....	Camden .....
16954	7-7 Fertilizer .....	Delair .....
16185	10-5 Fertilizer .....	Camden .....
	West Jersey Marl and Trans. Co., Woodbury, N. J.	
16131	Farmers' Friend, 1916 .....	Woodstown .....
16132	High Grade Truck Manure, 1916 .....	Woodstown .....
16133	Early White Potato Manure .....	Woodstown .....
16887	5-10-0 .....	Medford .....
16497	All Crop Mixture, 1916 .....	Fairton .....
16167	Owl Brand, 1916 .....	Woodbury .....
16603	Our 2-8-0 Brand .....	Swedesboro .....
	Abbott Worthley Co., Marlboro, N. J.	
16065	Worthley's Potato Manure .....	Marlboro .....
160071	<sup>1</sup> Worthley's Potato Manure .....	Marlboro .....
160020	Worthley's Jersey Potato Manure .....	Freehold .....
160072	Worthley's High Grade Potato Fertilizer .....	Marlboro .....
	J. R. Wyckoff, Princeton Junction, N. J.	
16051	Wyckoff's Special Potato Manure 4-8-3 .....	Princeton Junction ..
16052	<sup>1</sup> Wyckoff's Special Potato Manure 4-8-3 .....	Trenton .....

<sup>1</sup> Duplicate sample.

**COMPLETE FERTILIZERS**  
**Furnishing Nitrogen, Phosphoric Acid and Potash.**

NITROGEN.						PHOSPHORIC ACID.							POTASH.	
As Nitrates.	As Ammonia Salts.	As Soluble Organic.	As Insoluble Organic.	Total Found.	Total Guaranteed.	Soluble in Water.	Soluble in Ammonium Citrate.	Insoluble.	Total Found.	Total Guaranteed.	Available.		Found.	Guaranteed.
											Found.	Guaranteed.		
....	1.74	0.32	1.11	3.17	3.29	6.68	2.27	1.91	10.86	9.00	8.95	8.00	1.95	2.00
....	2.23	0.36	0.38	2.97	3.29	7.26	1.20	2.01	10.47	9.00	8.46	8.00	0.99	1.00
0.68	1.59	0.08	0.87	3.22	3.29	7.12	2.09	1.97	11.18	9.00	9.21	8.00	2.17	2.00
....	4.26	0.35	0.19	4.80	4.94	8.28	1.33	2.26	11.87	9.00	9.61	8.00	1.20	1.00
0.45	0.90	0.77	1.27	3.39	4.12	2.50	5.74	1.71	9.95	9.00	8.24	8.00	2.28	2.00
....	0.23	0.19	1.11	1.53	1.65	5.16	2.73	2.94	10.83	9.00	7.89	8.00	0.98	1.00
....	0.24	0.24	0.43	0.91	0.82	6.16	2.74	1.08	9.98	9.00	8.90	8.00	1.03	1.00
....	2.09	0.76	1.31	4.16	4.11	7.54	2.33	2.13	12.00	11.00	9.87	10.00	.....	.....
....	0.03	0.67	<sup>1</sup> 1.12	1.82	1.64	8.94	0.72	0.15	9.81	9.00	9.66	8.00	.....	.....
0.68	0.11	0.76	1.56	3.11	3.28	8.66	1.73	1.47	11.86	9.00	10.39	8.00	.....	.....
2.92	1.15	0.45	1.24	5.76	5.74	6.50	2.13	1.23	9.86	8.00	8.63	7.00	.....	.....
3.66	2.30	0.76	2.16	8.88	8.24	4.44	1.94	1.16	7.54	6.00	6.38	5.00	.....	.....
0.60	0.86	0.34	0.65	2.45	2.47	5.94	1.49	1.59	9.02	7.00	7.43	7.00	1.00	1.00
Tr.	2.24	0.32	0.82	3.38	3.30	7.10	2.27	1.59	10.96	8.00	9.37	8.00	1.04	1.00
0.67	1.75	0.15	<sup>2</sup> 0.69	3.26	3.30	6.08	1.83	1.31	9.22	7.00	7.91	7.00	0.99	1.00
....	1.80	0.43	1.55	3.78	4.12	8.66	1.75	1.59	12.00	10.00	10.41	10.00	.....	.....
0.66	0.58	0.19	<sup>3</sup> 0.51	1.94	2.05	4.76	2.45	2.29	9.50	6.00	7.21	6.00	0.83	1.00
0.57	0.33	0.30	<sup>4</sup> 0.78	1.98	2.05	4.30	2.75	2.93	9.98	6.00	7.05	6.00	0.78	1.00
....	0.04	0.41	<sup>5</sup> 1.04	1.49	1.65	5.40	2.33	2.31	10.04	8.00	7.73	8.00	.....	.....
....	1.15	0.68	1.34	3.17	3.29	4.78	2.67	3.11	10.56	8.50	7.45	8.00	.....	.....
....	1.33	0.45	1.43	3.21	3.29	5.10	2.64	2.75	10.49	8.50	7.74	8.00	.....	.....
....	1.38	0.83	1.07	3.28	3.29	7.40	3.28	2.15	12.83	10.50	10.68	10.00	.....	.....
....	1.08	0.74	1.36	3.18	3.29	3.74	4.05	2.31	10.10	8.50	7.79	8.00	1.90	2.00
2.35	0.05	0.11	0.42	2.93	3.20	5.54	2.58	0.78	8.90	8.00	8.12	8.00	3.13	3.00
1.75	.....	0.14	1.02	2.91	3.20	3.48	4.23	1.74	9.45	8.00	7.71	8.00	3.01	3.00

<sup>1</sup> Inferior quality. Activity 35%.

<sup>2</sup> Inferior quality. Activity 36%.

<sup>3</sup> Inferior quality. Activity 42%.

<sup>4</sup> Inferior quality. Activity 47%.

<sup>5</sup> Inferior quality. Activity 47%.



NEW JERSEY  
AGRICULTURAL  
**Experiment Stations**  
**Bulletin 298**

New Brunswick, N. J.

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# NEW JERSEY AGRICULTURAL EXPERIMENT STATIONS

BULLETIN 298

November 1, 1916

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Report of the Director for 1916

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By

JACOB G. LIPMAN, Ph.D.

## INTRODUCTION

As one of the factors in rural progress agricultural education is assuming a more commanding position from year to year. The State Agricultural College is now finding a wider scope for service through the authority vested in it by the Federal Smith-Lever Act. Thus it is able to impart instruction not alone in organized classes in the long and short courses in agriculture, but to the much larger constituency in the several countries of the State. In cooperation with the Experiment Station it has organized farm bureaus in eleven counties. It is employing a staff of extension specialists who act in an advisory capacity to landowners in New Jersey and are, in fact, traveling instructors in agriculture. It publishes printed matter on topics of interest to farmers, and it makes members of its teaching staff available for lecturing to audiences in the State.

The State Department of Education is making its organization more effective in the rural districts, as well as in the urban centers. To the general education which it is offering alike to pupils in the city and country, it is adding courses in vocational training best cal-

culated to bring young people into harmony with their particular environment. The sons and daughters of farmers are given an opportunity, in this manner, to gain a new interest in and a clearer understanding of the daily tasks on the farm and of their place in agricultural production. Aside from the project work in agriculture now conducted under its supervision, the State Department of Education is helping to organize agricultural courses in the rural high schools; and in due time will no doubt advocate the establishment of secondary schools where applied agriculture may be taught most effectively. It is also probable that the normal schools of the State will make more specific provision for adequately training the teachers of our rural schools.

Contributions to agricultural education are being made also by the New Jersey State Board of Agriculture. Its efforts are being directed toward awakening among the mass of producers the consciousness of common needs and of common responsibilities to a great industry. Its farmers' institutes, county board meetings and annual conventions are events distinctly educational in character. But even the police and statistical work of the State Board are not without some educational value. Nursery inspection, the control of tuberculosis among dairy cattle, the distribution of hog cholera serum, the study of foul brood of bees, and the gathering of information on markets and marketing all help in a more or less direct way to crystallize our knowledge of important agricultural problems.

In so far as they serve to enlighten the public on matters of agricultural production, the Department of Conservation and Development and the State Chamber of Commerce may be regarded with propriety as educational forces in agriculture. The first of these organizations is a consistent advocate of the rational development of the natural resources of the State. It recognizes the vast possibilities that lie in the soils and forests of New Jersey and is ever ready to give its enthusiastic support to such broad measures of public policy as would encourage the profitable use of the soils and forests. The State Chamber of Commerce, on its part, knows of the community of interest which must exist between the population of the city and country. It appreciates the interdependence of the producers and consumers of food. It appreciates the possibilities of wholesome legislation in behalf of the rural communities. With much discretion and intelligence, it is striving to mould

public opinion in the interest of good roads, sanitation, education and community organization.

Not least among the forces that help to bring enlightenment and progress to rural New Jersey are the various agricultural societies and organizations. The State Horticultural Society, the State Poultry Association, the American Cranberry Growers' Association, the breeders of Guernsey, Jersey and Holstein cattle, the North Jersey Agricultural Society, the farmers' exchanges and many other organizations all help to give the farmer helpful information and a broader outlook. Especial mention should be made, however, of the New Jersey State Grange and its pomona and subordinate granges. These are indeed educational institutions, for they lay much stress on their educational program. They do much for their members by bringing to them a better understanding of the social and economic problems that enter into the life of the farmer.

#### THE CALL FOR SERVICE

##### *The Larger Service*

There is need for all of the educational forces and agencies in the advance which is expected from the producers of agricultural commodities. The possibilities for agricultural expansion in New Jersey are still almost unlimited. Out of a total of 4,808,960 acres of land surface, there were improved in 1910 only 1,803,336 acres. There were, then, in 1910 more than 3,000,000 acres of unimproved land area in New Jersey. Since that time there have been increases in the acreage of the improved area in some localities and decreases in others. Altogether, there are now nearly one and three-quarter million acres of unimproved land in the southern counties of the State and approximately one and one-quarter million acres of unimproved land in the northern counties of the State. In South Jersey three of the counties, viz., Atlantic, Burlington and Ocean, possess considerably more than one million acres of land which is still to be made arable. Evidently, then, there is much elbow room in New Jersey and much constructive work which may be done when the time comes for placing a larger supply of food at the disposal of the rapidly growing urban population of the Atlantic Seaboard.

In considering broad constructive measures for the agricultural development of the State, one must reckon with a very considerable

number of leading factors. In northern as well as southern New Jersey much of the land is still far from accessible. There is need for the building of new roads and the improvement of roads already existing as one of the steps in the better utilization of our farm lands. Any plan for the rational development of a road system in New Jersey should include such tunnels under the Hudson and Delaware Rivers as would allow of the unhindered movement of motor-drawn and horse-drawn vehicles from New Jersey into New York and Pennsylvania. Such tunnels would at once attract large numbers of new settlers into the rural districts of the State, would enhance production and also lead to a substantial increase in taxable values. When considered from the standpoint of agricultural development, tunnels under the Hudson and Delaware Rivers should be regarded as very attractive investments, since the benefits to be derived would go to the consumers as well as to the producers of foods.

For a number of years the Station, and later the mosquito extermination commissions in a number of our counties, have striven to awaken the recognition among the people of the State that the mosquito pest is a problem of great economic magnitude. Notwithstanding the opposition from many directions, the leaders in mosquito extermination work in New Jersey have been able to convince a large portion of the intelligent public that mosquitos can be reduced to such small numbers, if not entirely exterminated, as to prevent them from being a source of serious discomfort and a check on the development of much of the territory of the State. It is gratifying to note that in North Jersey, at least, the mosquito extermination activities of the county commissions and of the Station have been quite effective. In the counties of Essex, Hudson, Union and Bergen, the mosquito pest has been reduced to such an extent as to call forth enthusiastic comments in the daily press and among the residents of that territory. Because of the practical elimination of the serious annoyance from mosquitoes much of the suburban territory in these and adjoining counties has attracted new residents. An increasing number of suburban homes is being built in this territory and taxable values have been increased greatly. But, gratifying as has been the progress in mosquito extermination in northern New Jersey, there is still much to be done in South Jersey. If the same degree of success could be attained in that portion of the State in the elimination of mosquito-breeding areas,

many thousands of acres of land in the counties of Cumberland, Cape May, Atlantic, Burlington and Ocean would be taken up and developed for agricultural purposes. The methods now employed in mosquito extermination have been sufficiently tested to make it certain that they would be quite adequate in accomplishing their purpose. It remains for the State and the counties concerned to provide the funds that would allow the completion of the work within the period of a few years. With the reduction of mosquitoes to insignificant numbers, one of the most serious checks on the agricultural development of a large portion of southern New Jersey will have been removed.

In considering agricultural development in New Jersey, mention should be made of the large extent of meadow and swamp land which could be made more productive by means of suitable systems of drainage. These undrained lands are usually rich in plant-food and, thanks to their peculiar relation to the water supply, could be made to yield large harvests. They are suitable for the growing of forage crops for cattle as well as of vegetables of good quality. Mention may be made, also, in this connection of the possibilities of overhead irrigation in making arable thousands of acres of the open sandy soils in the southern counties of the State.

As one thinks of the physical limitations in agricultural progress, he is made to realize that the improvement of roads and other means of transportation, systems of drainage and irrigation and the extermination of mosquitoes are but single factors in the scheme of development. The welfare of the entire agricultural industry must, in the last analysis, depend on the effectiveness of the individual farmer as a food producer. His effectiveness will be determined by his industry, by his training and education and by the working capital which he may have at his disposal. But even with these, he often feels helpless in a social and economic organization which is becoming more complex from year to year. He finds that the raw materials which he must have on the farm are controlled by large organizations of capital. He finds that he must meet a keener competition from the city industries in the labor market. He feels that much of the recent advance in industrial production has been made possible by the organization of large units. His is then a small enterprise less economically managed because it is smaller than a large industrial enterprise. The increasing cost of labor and raw materials is almost a menace to the

present organization of agricultural production. It is becoming apparent that agriculture as an industry will have to find greater efficiency in production either by the organization of larger farm units or by cooperation among the smaller farm units. Students of agriculture realize that the organization under single management of very large farms containing many thousands of acres might be desirable from the standpoint of efficiency in production. They would be entirely undesirable in that they would destroy the existing social fabric of our rural communities, would seriously undermine the independence and initiative of the individual farmer and would threaten the very existence of the farm home. Instead of a number of independent farmers, we should have then a few well-paid managers and a large number of hired men who would feel no direct responsibility in safeguarding the interests of the social and religious life of our rural districts. It is safe to predict, therefore, that the coming decades will see much change in methods of agricultural production and distribution. Farmers will learn to conserve labor by cooperative effort, particularly by the use of the more costly labor-saving machinery. Farmers will also learn to standardize their produce and to reach the consumer as directly as conditions may permit. As a prerequisite of effective cooperation, the individual farmer will find himself in need of a better general education and of greater skill in the handling of his raw materials and of the implements of production.

### *The Special Service*

The farmers of the State are insistently calling for certain service. Potato growers, both of central and southern New Jersey, feel that the potato crop is of sufficient importance to warrant the employment of a potato specialist at the Agricultural Experiment Station. The potato specialist should be available for a study of questions that, in the interest of the potato crop, call for an early answer. It is felt by the potato growers that means should be found for controlling potato diseases that are more or less troublesome. A study should be made of home-grown seed and the feasibility of depending on home-grown seed. A study should be made of fertilizer and other soil fertility problems peculiar to the growing of large crops of potatoes. A study should also be made of systems of cropping and of farm management that would bring the potato crop into more profitable relation to the other crops that may be grown in potato sections.

Strawberries, raspberries, blackberries, gooseberries and currants are important crops in sections of southern New Jersey and elsewhere. These crops have their insect enemies and fungous diseases which at times seriously interfere with profitable production. The entomologist of the Experiment Station has been fortunate in finding a satisfactory remedy against the destructive attacks of the strawberry weevil. Other work could be done profitably both in the control of insects and plant diseases and in the improving by selection and breeding that would render berry production in New Jersey more certain and more remunerative. The same may be said, also, of ornamental plants and of cut flowers. The value of these is becoming greater from year to year. There are insects and plant diseases peculiar to ornamental plants and men should be available for the study of these problems so that they may be disposed of to the satisfaction of the growers.

There is a strong demand for help in the dairy industry of the State. The cow testing associations in North and South Jersey have already done much toward the elimination of unprofitable cows and in the introduction of better methods of feeding. Unfortunately, however, the cost of concentrated feeding stuffs has recently increased to such an extent as to make milk production, notwithstanding the somewhat better prices of market milk, far from profitable. Much has been said in the agricultural press and in the daily papers concerning the apparently excessive cost of delivering milk to the consumer. It is not at all unlikely that better organization among the dairymen and cooperation in the buying of feeding stuffs, the further elimination of less profitable cows and the introduction of better forage crops and better methods of growing the more common forage crops would result in such economies as to benefit both the producer and the consumer of dairy products. The Experiment Station is expected to serve more largely than it is now serving in supplying advice as to feeding, breeding, the handling of milk and the construction of dairy buildings.

There is a growing conviction among the people in the State that there should be produced in New Jersey, if not all of the meat consumed by its residents, at least a much larger amount than is now being produced. It is true, no doubt, that the production of pork, mutton and beef may be encouraged and made profitable if such production is adjusted to the types of farming which prevail in the State. All will agree that much forage is now being wasted

in New Jersey on the salt marsh, on fresh water meadows and generally on our farms and in our forests. A system of meat production best suited to eastern conditions should be devised. Cooperation should play an important role in solving this particular problem.

The poultry industry of New Jersey has experienced within the past few years a truly remarkable growth. Poultry-keeping appeals to persons of limited capital. Such people can make a modest living out of the keeping of poultry. This is well proved by the establishment of many small plants in northern, middle and southern New Jersey, and the increasing production of eggs and meat for consumption in the nearby towns and cities. The entire industry will be benefited by more thorough organization, and the producers by cooperative buying and cooperative marketing, as well as, the more intelligent dealing with poultry diseases that are often so costly and inimical to profitable poultry husbandry. The Poultry Department of the Station has rendered yeoman service to the industry in stimulating the organization of local poultry associations, in encouraging the introduction of modern methods of poultry house construction and of feeding and breeding. The research work of the Poultry Department is bringing to light facts which should later prove of great value to the industry.

Vegetable growing is one of the specialized types of farming which is becoming more prominent in New Jersey from year to year. Successful vegetable growing calls for high intelligence and skill and involves a knowledge of soil fertility, entomology, plant pathology and botany. Intensive methods are being practiced to an increasing extent. But, as the practice in vegetable growing becomes more intensive, the fertilizer, insect and plant disease problems also become more troublesome; hence, a demand on the part of vegetable growers for special service in these directions. The staff of the Experiment Station is rendering such service as the present facilities will permit. It is hoped, however, that these facilities may be made more adequate through larger appropriations to the Station. Aside from production, the growers of vegetables recognize the need for cooperative marketing and standardization of products. There is every indication that much progress is to be made in the near future in the organization of cooperative marketing among the growers of vegetables.

Fruit growing in New Jersey is one of the most progressive of

its agricultural industries. Thanks to the energy and intelligence of the members of the New Jersey State Horticultural Society, the fruit growers of the State have learned to appreciate keenly the value of quality in fruit. The fruit exhibits at local fairs and at meetings of the county and State organizations are direct evidence that there has been ample progress made in fruit production. There has come to the fruit growers in the State much knowledge concerning fruit varieties, methods of planting, methods of fertilization, methods of spraying and methods of packing. Persons interested in New Jersey agriculture always experience a feeling of gratification and pride in inspecting the fruit exhibits of New Jersey fruit growers.

Another of the industries which occupies high rank in the State is that of cranberry production. The cranberry industry is a highly specialized one and calls not alone for a large outlay of capital but also of peculiar knowledge and training of a fundamental character. The cranberry grower must understand how to assure an adequate supply of water for flooding his bogs, must understand the nature of the insect and fungus enemies of the cranberry crop, must know something about cranberry fertilization and the packing, handling and storing of cranberries. The growers of this crop have been enabled to record progress largely because of their organization and the careful study of the needs of their industry. There are requests from them, as there are from fruit growers and others, for special service of a research character.

#### MEETING THE DEMAND

The demand for special service has been met as far as practicable within the past year. Experiments have been in progress on the use and action of commercial fertilizers, means for increasing the availability of soil potash, means for increasing the recovery from nitrogenous fertilizers, and means for increasing the nitrogen content of the soil with the aid of green manures. Soil investigations are being conducted on a field scale and also in cylinders and pots at the College Farm. Other fertility studies are being made in the experimental peach orchard at Vineland, N. J., and in a number of counties under the supervision of farm demonstrators. The study of lime problems has received much attention within the past year. Aside from comparisons of magnesian and non-magnesian lime in different amounts and for different crops, studies have been made in the laboratory on the influence which ground limestone of

different degrees of fineness may have on soil microorganisms and on the rate at which limestone of different degrees of fineness may neutralize soil acidity. Inoculation studies with soil bacteria have been continued, especially in connection with the growing of soybeans. One of the notable results of the soil research at the Station is a method for making available the phosphoric acid of insoluble phosphates by means of the oxidation of sulfur. It has been demonstrated that sulfur when mixed with soil is changed by microorganisms into sulfuric acid. This fact has been known for several years. The director of the Station suggested in the fall of 1915 that a practical application be made of this knowledge in that sulfur, ground phosphate rock and fertile soil be composted together. A large number of tests made with different mixtures of sulfur, ground phosphate rock and soil have shown that the sulfuric acid derived from the sulfur actually does make available the phosphorus in the phosphate rock. The method has been outlined in scientific and popular papers and is likely to prove of great practical value.

The entomologist and the plant pathologist of the Experiment Station have been conducting investigations on the control of insects and plant diseases injurious to fruit, berries, vegetables, potatoes and greenhouse and ornamental plants. Gratifying progress has been made in the control of the strawberry weevil, in the control of pear blotch and of one of the troublesome celery diseases. Progress has been made also in other directions as recorded in the statements of the departments concerned.

Something has been added to the sum total of our knowledge by the investigations in the Departments of Dairy Husbandry, Animal Husbandry and Poultry Husbandry. Experiments have been carried on in connection with the use of milk substitutes for calves, and tests have been made of different mixtures for the purpose of determining the most economical methods of feeding dairy cows. The place of forage crops in economic pork production has been further studied and earlier results have been confirmed. The self-feeder has demonstrated its utility in lowering the cost of pork produced under eastern conditions. A study has been made of improved types of forage crops and field crops, and likewise of farming in vogue in central and southern New Jersey. The farm management investigations of the Agronomy Department have been published in part in Bulletin

294 of the Station. Other bulletins on similar subjects will appear at a later date. Mention should be made also of drainage studies, plant-breeding investigations and the study of oyster propagation. These and other experiments and investigations have already borne fruit and give promise of contributing in a larger way to the different agricultural interests of the State.

In carrying on the investigational work of the Station, the staff has been fortunate in having had placed at its disposal increased facilities. Trustees and friends of the College made available for use by the Horticultural Department of the Station a farm of 35 acres located on Ryder's Lane. This farm is to be used for the growing of vegetables as well as of fruit trees, and is a particularly welcome addition to the resources of the Station in that the soil of this farm is of a sandy loam and suitable for vegetable growing. Most of the land of the College Farm is not suitable for that purpose. A greenhouse laboratory has been built and occupied. This is to serve the needs of the Department of Botany and is to be occupied by the plant physiologist of the Station. Another greenhouse is in the process of construction. When completed, this will be used by the Department of Plant Pathology. The dairy herd of the Station has been increased by gifts and purchase. The Director of the Station wishes at this time to thank Messrs. L. F. Loree, A. A. Cortelyou, Grant B. Schley, Bernard Meyer, Percival Roberts and James C. Turner for gifts of dairy animals. These are thoroughly appreciated and will help the Dairy Department to build up a very creditable dairy herd for both the Station and College. Also, the herd of swine at the Station has gained in value both by purchase and natural increase. It is at present one of the best balanced station herds in the country.

Under the direction of the administrative officer and the librarian of the Station, there is being published a technical journal known as "Soil Science." The establishment of this journal has made possible the more satisfactory publication of papers by soil investigators in this country. Formerly, soil research papers were published in European journals. Moreover, the establishment of the journal has given the Experiment Station and Agricultural College of New Jersey an opportunity to conserve more effectively the funds available for the printing of bulletins and circulars. "Soil Science" has now subscribers in nearly all of the states of the Union and in a number of foreign countries.

It is probable that two or three additional farm bureaus will be provided in the near future. The activities of the farm bureaus already established have met with favor in their respective counties. The farm demonstrators are not merely giving information on timely topics, but are also helping to crystallize public sentiment on questions which concern the entire agricultural industry. The correspondence of the Station has experienced further growth. The number of letters written by the extension specialists, farm demonstrators and members of the research staff was much larger than in the preceding year. Indeed, the volume of correspondence has grown to such dimensions as to demand a considerable expenditure for clerical services. Technical bulletins and circulars have been published. Their titles and date of publication are given elsewhere in this report. Educational exhibits have been shown at a number of local fairs as well as the Interstate Fair at Trenton, N. J. The interest displayed in these exhibits and the correspondence of which they were productive show that such exhibits are educational factors of considerable moment. As usual, there were a large number of visitors at the College Farm and Experiment Station. Many of them came for the purpose of consulting members of the staff in person relative to farm problems. Others came to inspect experimental work now in progress. There were also many visitors at the experimental peach orchard at Vineland, N. J., and hundreds of persons attended the demonstrations given by the extension specialists of the Station in different localities of the State.

#### *Limitations of the Station's Service*

In applying the knowledge already accumulated in the field of agriculture, one finds certain limitations which can be overcome only with more or less difficulty. New methods must not only overcome the conservatism of the farmers, but undoubtedly demand technical information which the farmer does not always possess. Thus, the introduction of new machinery, of new fertilizers, of new insecticides or fungicides call for greater technical skill and training. In other words, as the business of farming grows more complicated, the successful farmer finds himself obliged to broaden his knowledge and to acquire a more fundamental education. It is obvious that the successful farmer of today must be a man educated in different directions and capable of understanding various technical problems. The service rendered by the Experiment Station finds its limitations among those of the farmers of the State whose education

and experience are not in keeping with the most advanced agricultural thought.

The service which the Station would attempt to render finds its limitations also in the lack of working capital and in the lack of cooperation among farmers. That these limitations will be removed in time there is no doubt. Meanwhile, the various educational forces in agriculture will have to do their full share in preparing the farmer and his sons for coping with the problems which the future must bring. There are also limitations within the Station service itself in that facilities for research are not always adequate, nor are the equipment and staff always in keeping with the many questions which should be answered. There is danger in attempting too much. From the standpoint of research, it is much better that few problems be investigated thoroughly rather than many problems superficially.

## FUTURE PROGRESS

### *Better Education*

Agricultural progress of the future will be determined by the progress of the educational forces and agencies in agriculture. Better education must be provided for the coming generation of farmers. We must have better rural schools, we must have agricultural courses in the rural high schools. There should be provided in the rural districts of the State secondary schools where agriculture may be taught as a vocation. Short courses in agriculture and movable schools can be and should be made more effective in their organization and scope. The organization of agricultural societies should be encouraged as should be the reading of good farm papers and of good books on agriculture. Not least among the educational agencies is travel. Better roads, the telephone and the automobile have widened the farmer's range of observation and, to that extent, have added much to his education. The further expansion of the farmer's range of observation is to be encouraged and hoped for. This will be readily admitted by all who feel that new ideas and improved methods mean much in agricultural advancement.

### *Development of More Intensive Production*

Specialization is one of the striking characteristics of New Jersey agriculture. Many years ago New Jersey was a live stock state. Later it was a general farming state and a dairy state. Now it is designated as the "Garden State." Its fruit growers, vegetable

growers, florists, poultry keepers and certified milk producers seem to be holding their own with their brethern of other states. The values which express agricultural production in New Jersey are quite significant. The Census of 1900 credits New Jersey with an annual value of agricultural commodities produced of \$26,000,000. The corresponding value in 1910 was \$43,000,000. In 1915 it was \$68,000,000, and in 1916 it is likely to exceed \$80,000,000. This wonderful expansion in values has not been based on the increase of acreage under cultivation. As a matter of fact, the acreage under cultivation in 1916 was less than that of 1900 by about 300,000 acres. The increase in the value of agricultural commodities produced in the State has been due only in part to higher prices. More largely it has been due to larger yields per acre brought about by the more intelligent methods of fertilization and tillage. Specialization is to be further emphasized in the coming years. The farmers of the State will lay more and more stress on the production of crops of high commercial value. Soil fertility will be brought to a higher level as will also average crop yields. But, as the methods of production are made more intensive, the danger from attacks by insect enemies and injurious fungi will also be increased. Fertilization problems will become less simple and the Experiment Station will be called upon to investigate the new problems that might arise and to offer technical advice on an increasing number of subjects. As cooperation in production finds a firmer place among farmers, as the transformation of more of the raw materials into finished products becomes more common, new questions and problems will be presented to the Station. There will be need of information on the canning of vegetables and fruits, the drying of vegetables and fruit, the preservation of meat by curing, smoking, pickling, etc., and a number of other questions.

### *Provision for Larger Service*

The larger service demanded from the Station will call for additions to the staff, additions to the acreage of arable land and additions to the buildings and equipment. It is far from the thought of the director and his associates to ask for appropriations that may be premature. The need has already come, however, for buildings that could be used both by the College and the Station. The most pressing need is that of a horticultural building that should contain classrooms and laboratories, primarily for the purposes of instruc-

tion. This building should also contain laboratories and offices for the staff of the Horticultural Department of the Station. The need is also becoming felt more strongly for an animal husbandry building and a machinery building in which there could be stored agricultural machinery and implements to be used for instruction, demonstration and research purposes. After all, the appropriations made to the Station are in the nature of an investment which, to judge by the long record of service, should return handsome dividends in the future as it has in the past.

### STATION ACTIVITIES

Brief resumés of the activities of the several departments of the Station as submitted by the heads of these departments are herewith given. These will serve to furnish information concerning the research projects and other activities of the institution.

### CHEMISTRY

The department's activities have been confined mainly to the inspection work as required by the laws regulating the sale of fertilizers, agricultural lime, feeding stuffs and insecticides. During the year 2278 samples were examined and duly reported on. These examinations required about 19,000 separate determinations.

#### *Fertilizers*

Registrations by 131 manufacturers .....	1493
Samples received .....	1640
Samples analyzed .....	1018

The tonnage reports received during the fiscal year were as follows:

		Tons
Nov. 1915	Mixed fertilizers .....	53,288.11
Nov. 1915	Fertilizer materials .....	5,459.28
Apr. 1916	Mixed fertilizers .....	61,368.88
Apr. 1916	Fertilizer materials .....	9,032.38

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Total tonnage for the fiscal year ..... 129,148.65

On account of the unusual conditions of the markets, it was impracticable to prepare a schedule of values and, consequently, no valuations have been calculated for the materials that were examined within the period covered by this report. The samples that were examined consisted of the following:

565	samples of commercial fertilizers
27	samples of commercial fertilizers (duplicates)
45	samples of commercial fertilizers ( unofficial )
13	samples of home mixtures
208	samples of fertilizer materials
43	samples of ground bone
117	samples of sundry materials

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1018	total.
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Five hundred and sixty-five brands of mixed fertilizers were examined. All of these were accompanied by guarantees, with one exception. The average of the guaranteed samples substantially satisfied the guarantees as given. A detailed study of the results, however, shows that the goods delivered were not satisfactory. One hundred and twenty-two brands fully satisfied every guarantee given, and in addition to this number 233 brands substantially satisfied the guarantees. The remaining brands, or about 37 per cent, were deficient. One hundred and eighty-two brands were deficient in one element, 26 in two elements and one in all three of the elements. There were 1406 deficiencies possible, and of this number 237, or 16.9 per cent were found. This is the largest percentage of deficient brands found since 1903.

Some rebates have been paid by the manufacturers on account of the shortage found, but it is safe to say that a large sum of money has been paid by the purchasers for which no value has been received.

There were 139 deficiencies in nitrogen, the largest number reported since the inspection work started. On account of the serious condition, the State chemist has called particular attention in the second fertilizer bulletin to the situation, and stated that inasmuch as it is not the duty of the State chemist to enforce the law, the purchasers should make use of the reports which they receive in order to secure the plant-food paid for. He also stated the method that should be followed in such cases.

#### *Agricultural Lime*

Forty-three manufacturers registered 87 brands. Thirty-five brands were examined and the detailed results, together with a list of the manufacturers and their addresses, will be given in the second fertilizer bulletin.

### *Commercial Feeding Stuffs*

Two hundred and ninety-four, or 26.6 per cent of the brands did not satisfy all of the guarantees given. During the 1915 inspection 17.7 per cent of the brands were found deficient. The percentage of samples that were found deficient in protein and fat this year is about the same as that reported last year. The poorer showing this year was due to the large increase in the fiber deficiencies.

### *Insecticides*

Fifty manufacturers registered 198 brands of insecticides. Eighty samples were collected by our inspectors, 74 of which were examined. The composition of these samples was found to correspond to the guarantees given. A bulletin on the subject is to appear in the near future.

### HORTICULTURE

The test of different benching dates of carnations is completed, as are the lime studies with roses. Considerable progress has been made in the peach-breeding work. Four hundred seedling trees were planted out in orchard form in the spring of 1916, and more than two thousand trees from known crosses were produced in the nursery last season, and will be ready for planting the spring of 1917. An additional lot of pits, more than two thousand in number, were secured as a result of the crossing work this past summer. These have been stratified and will be planted out in nursery form next spring. The Station will soon have a large number of seedling peach trees of known crosses for study.

The pruning experiments with peaches require much time for the recording of data. These experiments were started in 1912 and the trees have now produced three crops. The first two seasons' results have been written up and are now nearly ready for publication. The fertilizer experiments with peaches were begun at Vineland in 1907. Records of yield have been taken of each individual tree in the experiments and furnish data for a bulletin which is to appear when time and funds will permit of its publication.

The pruning experiments with apples have been carried on since 1913, and records of considerable volume secured.

### *Vegetable Work*

Through the generosity of trustees and friends of the College, a 35-acre farm located near the College Farm was purchased in the

spring of 1916. This farm is now being used for the development of instruction and investigation work in vegetable gardening. The soil is of a medium loam type and distinct from the red shale, the prevailing type in the vicinity of New Brunswick. The Station has been in need of a plot of land where vegetable work could be carried on under favorable conditions. It is hoped that the vegetable investigations at the New Jersey Station may be developed in keeping with the progress of the fruit investigations.

### *Projects*

The following projects have been outlined: fertilizer experiments with standard apples and dwarf pears and peaches; pruning experiments with apples, peaches and pears; variety tests of apples, pears, peaches, plums, grapes and small fruits; cover crop, breeding and spraying experiments with peaches; the study of dynamiting for tree planting; the study of peach yellows and little peach; soil, fertilizer, lime, moisture, breeding and bench construction studies with carnations; and soil and fertility studies with roses and gardenias.

### ANIMAL HUSBANDRY

Responsive to the continued interest in problems relating to pork production, the experimental work conducted by the department has centered around studies in the growing of forage crops and determining their relation to economical feeding. To meet the peculiar conditions that exist in this State, a series of experiments were planned to determine not only the most palatable mixture of green forage, but likewise to suggest conclusions relating to the crop that would supply forage throughout the season, and more especially at a time of year when it would serve the animals to the best advantage.

It is essential that a forage crop be palatable, that it yield abundantly and that it be hardy enough to withstand not only unfavorable seasonal conditions, but also the tramping incident to foraging by the pigs themselves. While it has been generally assumed that permanent pastures meet this condition, our investigations go to show that it is important that areas given over to the growing of swine be plowed each year in order that the best results and the most efficient returns shall be obtained.

Rather than rely on any single forage crop to supply these requirements, our investigations prove conclusively that combination mixtures serve this end to the best advantage. Rape and sweet

clover in combination with oats as a protecting crop with red clover added to establish permanence has many advantages. Rape alone is not especially palatable, neither does it grow as vigorously as when produced in combination with a legume. Furthermore, such combination mixtures simplify the selection of a concentrate, as corn is clearly the only supplementary feed that market pigs require when foraging on such a combination of forage. Soybeans in combination with rape and sweet clover proved to be an excellent mixture, but have the disadvantage of being a relatively short season crop, as it is not practical to plant the soybeans early in the season.

More important, perhaps, than the problem of producing forage crops is the question of the selection of concentrates for feeding breeding, as well as market pigs. The unprecedented increase in the cost of concentrates has complicated the problem of rations. Furthermore, the cost of labor has increased substantially and the live stock farmer is confronted by the question as to whether even as efficient an animal as the pig can be relied upon to convert high-priced grain into pork products at a profit, in view of the fact that it is a relatively long distance in marketing between the animal on the hoof and the animal on the hook, especially under conditions of distribution that prevail in this State.

Our experiments of last year pointed to the fact that the free choice system would simplify the labor problem to a certain degree, and that the pig could be safely relied upon to select and balance his own ration, provided opportunity were afforded. It is interesting to note that the season's investigational work indicates that the use of the self-feeder shortens the growing and fattening period by at least 60 days, and that in the end this method has many advantages. It is evident, however, that the most economical use of forage crops does not obtain when pigs are given access to both the self-feeder and forage crops, but rather that they will prefer to rely upon the concentrates as a source of nutrient rather than to forage extensively in the field. It seems, therefore, important to limit the amount of grain supplied in connection with forage crop feeding until the animal has reached at least 100 pounds in weight, if the greatest economy is to prevail. In other words, while the self-feeder has proved its value in supplying feed to brood sows, nursing pigs, and to mature market animals intended for fattening, it is an extravagant means of feeding gilts intended for breeding or even market pigs during the entire cycle of their growing period.

Believing that more attention should be paid to cost of maintaining a breeding herd, a series of experiments were conducted with the object of finding a ration suitable for wintering brood sows. Endeavoring to confine such products to those produced on the farm, ear corn and alfalfa hay were used as a basis for such a ration. Finding, however, that brood sows fail to consume large amounts of alfalfa hay when supplied in racks, it was planned to grind the hay and supply it in the form of alfalfa meal. It developed that this was a practical solution of the problem. A 300-pound brood sow would consume scarcely more than one pound of alfalfa hay when supplied in racks, but when the hay was ground and moistened with molasses it was a regular occurrence to have a brood sow of this size consume as much as 3 pounds of alfalfa hay per day, and in this amount the hay could be relied upon to supply the bulk of her maintenance requirements. It was possible, therefore, to reduce the daily cost of maintenance for a 300-pound brood sow from 12 cents to 7 cents per day by the simple process of grinding the alfalfa hay and mixing it with molasses, and supplementing this combination with a little hominy and tankage chop. The brood sows gained regularly on this mixture, settled promptly when mated, farrowed strong vigorous pigs, and went through the nursing period with more flesh than in cases where the corn and alfalfa hay was relied upon entirely as a source of feed.

During the coming winter we shall run these experiments in duplicate, and hope to verify the figures, which give promise of suggesting more economical and practical rations for brood sows.

With black strap molasses at 24 cents per gallon, it seems doubtful whether it can be used as a substitute for corn or hominy meal. Under average conditions, when it sells for 8 or 9 cents a gallon, it is clearly evident that it would serve in reducing the cost of grains where it was used as a substitute for corn or hominy and mixed with alfalfa hay and tankage. It is interesting to note the results of the experiments conducted with 10 gilts, five of which were fed molasses and alfalfa hay exclusively from the time that they were weaned until after their first litter of pigs had been weaned. Their gains were made at slightly more than 3 cents a pound less than those obtained with the five gilts fed corn, tankage and alfalfa.

Considerable difficulty was experienced during the year with hog cholera. In spite of the fact that the entire herd was subjected to the serum simultaneous method of treatment under conditions that

should avoid infection, losses were frequent and doubtful as to cause. That the double treatment under average conditions does stunt the growth of pigs seems well supported by conditions that prevailed in our herd during the past year. The claim that suckling pigs from immune sows carry such immunity during their nursing period was not verified in the Station herd, for losses were recorded among suckling pigs nursing immune sows, although the sows themselves were perfectly healthy. It would seem that, if the double treatment checks the vigor and vitality of the animal and prevents him from making normal gains during the early growing period, its general adoption should be discouraged.

The breeding herd has reached a stage as to numbers and quality that should allow constructive work in breeding and economy in production. It is hoped that the question of costs in production may be worked out next year, although the abnormal conditions prevailing at the present time may discourage such an undertaking.

#### POULTRY HUSBANDRY

The work in the Poultry Department during the past year consisted of carrying on projects which have been under investigation for a number of years, special attention being given to feeding, incubation and breeding problems. The amount and best sources of protein in poultry rations have been studied with great detail. Certain incubation problems, especially the cause of death of chicks during the latter stages of incubation are being investigated definitely in a series of projects which will cover a number of years. The work of breeding for fecundity and the inheritance of egg shell color and plumage pattern are progressing satisfactorily. A wonderful opportunity has been presented for the securing of a great mass of valuable data pertaining to egg production and the inheritance of this character, together with correlation observations pertaining to egg production and the physical appearance of birds through the Poultry Department's activities in supervising the Vineland International Egg Laying Contest which starts November first of this year. Now that the poultry farm is approximately completed more time and energy from the department staff members can be centered upon research problems and the detail of research work will be less interfered with than during the past three years.

#### DAIRY HUSBANDRY

The work of the Dairy Department for the past year has been

practically a continuation of the work carried out during the few previous years. This naturally divides itself as follows:

1. The herd—including changes in the herd, records of milk production and cost, and data in connection with the cost of raising heifers and calves.
2. Cow testing associations.
3. Advanced registry work.
4. Testers' license, and Babcock test glassware regulations.

### *The Herd*

The most gratifying features in connection with the work of the Dairy Department for the past year has been the marked increase in the average milk production of the animals in the herd, and the general improvement in the health of the herd. The average production per cow for the year just closed was 9505.9 pounds as compared with 7671.9 for the preceding year, an increase of 1834 pounds per cow. This increase may be attributed to heavier feeding and to the elimination from the herd of several animals which were found to be unprofitable. The loss due to contagious abortion, which was so prevalent in the herd a few years ago, has been checked and at the present time the herd is practically free from this trouble.

Several pure-bred animals have been added during the year and, with a natural increase from these and other animals in the herd, it should be only a matter of a few years when all the grade animals can be eliminated. Owing to a heavy increase in the cost of concentrates, the cost of producing milk is considerably higher than in previous years. This same statement applies to the cost of raising heifers and calves.

### *Cow Testing Associations*

The three cow testing associations which were in operation last year have been reorganized and, in addition, two new associations have been formed. The associations now in operation are located as follows: Sussex County, two; Salem County, one; Cumberland County, one, and Bergen and Passaic Counties, one.

Early in the year, Mr. John W. Bartlett was appointed Extension Specialist in Dairy Husbandry and the development of this work has been placed under his supervision. Interest in this work is increasing and it is quite possible that several more associations will be organized during the coming year. Records of the production and

cost of feeding the 2500 or more cows now under test are being kept by this department. When deemed sufficient, these records will be compiled for the purpose of comparing the cost of milk production from year to year.

### *Advanced Registry Work.*

The number of tests supervised by this department for breeders of pure-bred cattle in this State shows a slight increase over the pervious year. In keeping with the policy of the department of former years, records of the production, amount and cost of feed of all animals under test have been kept. It is the intention of the department to compile these records as soon as sufficient data have been gathered, and some valuable information may be obtained therefrom.

### *Testers' License Division*

The law regulating the weighing, testing and purchasing of milk and cream (Chapter 31, Laws of 1916) passed at the last session of the State Legislature, went into effect September 1, 1916. A copy of the law and full information concerning the rules and regulations to be complied with are contained in Circular 62, prepared by this department. A copy of this circular will be sent to any person, on request. To date, 41 applicants have taken the testers' license examination, and, of this number, 34 have been successful. Two thousand and nineteen pieces of glassware have been inspected 0.7 per cent of which was found inaccurate. As yet a sufficient opportunity has not been afforded to enable the department to offer any comment as to the working of this law.

### SEED CONTROL

The work of the Seed Laboratory during the year has been similar in nature to that of preceding years, inasmuch as it has been an attempt to carry out the provisions of the law and to make the service rendered as valuable as possible. While the character of the work has not materially changed, the quantity has increased in proportion to the demand. Although the total number of samples received for tests represents an increase of only 20 per cent over the number received within the preceding year, the increase from the first year is over 100 per cent.

During the year the seed analyst has prepared for publication circulars on weed control and describing the new seed law and a bul-

letin giving the results of tests of official samples for 1914-1916, with pertinent information and various news items dealing with seed problems.

The Seed Laboratory was enabled to make a study of the crimson clover seed offered in 1916 and to make public the resulting information previous to the time of purchase. It is believed that information given at this time is infinitely more valuable than any results that may be published after the seed is sown and crops harvested therefrom. Unfortunately, however, such procedure is not generally possible owing to trade conditions and limitations of labor and funds. The new seed law, effective November 1, 1916, will accomplish practically the same result, inasmuch as agricultural seeds must be labeled with certain statements as to quality.

The quality of the seeds examined during the year calls for no particular comment. Instances of loss due to low purity and germination might be cited, but in each case available measures of protection were not adopted in due time.

Observations on the development of certain strains of alfalfa in different parts of the State have been reported. While these observations are too limited to be definitely conclusive, there are certain suggestive features worthy of some future attention.

Weed plants have been identified and advice given as to eradication. It would seem well worth the expense to devote a thousand dollars or more to the study of weed problems. A portion of this should be available for educational work along this line.

## AGRONOMY

The Agronomy Department is charged with two separate lines of work. The first of these embodies farm crops, such as the grains, and forage crops commonly grown in the State; the second embraces farm management, including farm organization, cost accounting, profits derived from different types of farming and labor efficiency.

### *Cereals*

During the past year 30 different varieties of oats, 34 varieties of wheat and 2 varieties of barley have been tested and studied. This is to meet the constant demand made by the farmers for the best variety of these different grains for growing in New Jersey. When the most desirable varieties of corn, oats and wheat are found with their adaptations, then these crops can be improved through selec-

tion for superior strains. By isolating proper varieties and improving them through selection, it should be quite possible to increase the yield of the corn crop 10 to 30 bushels per acre for the State as a whole. Since corn is a crop which cannot be satisfactorily imported from outside the State, it is necessary to develop varieties and strains particularly adapted to the State as well as to the different localities in the State. This work should include varieties of both grain and ensilage corn. When we consider that the value of this crop alone is 11 per cent of the total value of the agricultural products of the State, its development warrants more attention.

### *Forage Crops*

The forage problem for the State is becoming more acute with the high cost of feed. During the past year, 44 different grasses and legumes were grown on a small scale and their adaptations noted. Methods of alfalfa culture by seeding in rows, broadcast and with timothy were studied to determine their practical value. Sudan grass was grown in comparison with the millets.

### *Farm Management*

The major portion of the activities of the department was centered upon farm management work. Survey records obtained from Monmouth County were classified and records of farms classed as potato farms were completed, tabulated and published as Bulletin 294 of the Experiment Station. The tabulation of the general farms is almost complete and ready to be published in bulletin form. Work such as this forms a definite and authentic basis for the proper organization of a farm. It seeks and finds successful farms, successful crop rotations, successful farm practices, successful farm units, as well as successful farmers. Information such as this obtained from all the counties in the State would form a basis for the proper type of farming and the proper farm organization for each locality. Each farm as an individual is considered as a miniature experiment station and information from a large number of these miniature experiment stations is vast in possibilities and value. It shows what actually is taking place on the farms of the State as well as what should take place. It shows the proper type of farming that should be followed in each locality and serves as an accurate guide for the future development of the farms in New Jersey.

### *Cost Accounting*

Cost accounting has been started in three counties. This is commanding wide attention from farmers all over the State. Today the increased cost of farming makes it necessary for the farmer to keep records of his business.

### AGRICULTURAL EXTENSION

One of the strongest features of our extension work is the organized county farm demonstration service that is being rendered in 11 counties of the State. The county superintendent of farm demonstration is a member of the College staff and that makes him a representative of the College and Station within his county. It gives him direct touch with the research departments of the Station and enables him to be a medium through which any farmer wanting assistance can reach the Station quickly. The county farm demonstrator is not only a teacher, but also a cooperator, working out local problems in connection with those who are vitally interested. He is under the direction of representative men in the county and is the means used by them for the promotion of its best interests. The work of the eleven organized counties is in good shape and farmers in four unorganized counties are asking for the assistance of a farm demonstrator.

The Extension Division has specialists in farm crops, fruit growing, market gardening, poultry husbandry, dairy husbandry, soil fertility, home economics and boys' and girls' club work. These specialists assist the county demonstrators in organized counties and carry on as much work as their time will permit in other counties. The demand for such service is far beyond our ability to supply. Some increase in appropriation last year has enabled us to expand the work, but many requests necessarily cannot be met.

Special mention should be made of the work in home economics, girls' canning clubs, etc. Our young people are easily interested in industrial work and should be given instructors and leaders. It would be easily possible to increase the membership of home-making clubs, canning clubs, corn clubs, pig clubs, etc., ten-fold if we had an adequate force for organization and leadership.

The effectiveness of our extension work will be increased by its coordination with the work of the new Department of Agriculture at Trenton. In organized counties, the farmers' institutes are placed under the direction of county superintendents of farm demonstra-

tion, who are guided in turn by representative men and women of the county. The institutes are gaining in effectiveness as a result. Many county boards of agriculture will become the advisory committee of farm demonstration offices and gradually we shall have entire unity in all of the State's work in agriculture. We shall need annually some increase in State appropriation to take care of more organized counties, and especially for the development of work in home economics and boys' and girls' clubs. The degree of success that has been attained is due to the loyal support of the members of the grange and other progressive people in the rural life of New Jersey.

## SOIL CHEMISTRY AND BACTERIOLOGY

### *Nitrogen Availability Project*

The work under this project has been continued in accordance with the plan which has been followed for the past few years. The timothy on Plots 1A to 20B has been harvested, samples prepared and the nitrogen determinations made. However, the results have not been brought together for comparison.

The cylinders of Group L for the most part bore an excellent crop of wheat and the data in connection with this are being brought together. Next year's results will complete the fourth 5-year period for this experiment.

A crop of barley and a residual crop of buckwheat were grown on cylinders of Group N and nitrogen determinations have been made on all these samples. A report on this work will be included in this year's annual report. The results are, in the main, in accord with results secured in previous years but there is better agreement between duplicates than heretofore.

### *Nitrogen Accumulation and Utilization Project*

This includes the 320 cylinders of Group N, field plots 21 to 48, 49 to 56, 65 to 71, A to F, M to R, and also certain pot experiments. Crops were successfully grown on all cylinders and plots, and these have been carefully weighed and samples prepared for analysis. Many of the nitrogen determinations have already been made. On the cylinders leguminous green manure crops as a source of nitrogen have given excellent results. With but few exceptions they have proved superior to nitrate of soda (160 lbs. per acre) and stable manure (15 tons per acre once in two years). Very satisfactory

agreement has been obtained between duplicate cylinders.

In the lime and rotation experiments—field plots—the limed plots have not only given a larger yield than the check plots, but they have in nearly all cases given a crop with a higher percentage of nitrogen in the dry matter than the check plots. A careful examination of the roots of soybeans from limed and unlimed plots shows a decidedly larger number of nodules on the roots from the former than from the latter. This would indicate better inoculation and, therefore, a larger supply of available nitrogen for the plant, which would no doubt account for the higher percentage of nitrogen in the dry matter from the limed plots.

The continuous wheat plot, with a leguminous crop as a source of nitrogen, yielded almost twice as much grain and more than twice as much straw as the corresponding plot without a legume. Also there was recovered from the legume plot more than twice as much nitrogen as from the non-legume plot, and the dry matter of the former contained a higher percentage of nitrogen than the dry matter of the latter.

### *Sulfur Oxidation Project*

A large amount of laboratory work has been carried out to determine to what extent sulfur is oxidized in the soil by microorganisms. Also much work has been done to determine to what extent the sulfuric acid thus formed makes available the phosphoric acid of the rock phosphate. Work has been carried out by means of laboratory and pot experiments. The results so far are encouraging.

### *Soil Fungi Project*

An attempt is being made to determine whether soil fungi play a part in the oxidation of sulfur.

### *Soil Bacteria Project*

Counts have been made on samples from certain of the field plots and the ammonifying power of soil from plots receiving different lime treatments has been determined.

### *Soil Protozoa Project*

With reference to the last project, there appears to be nothing definite to report at this time.

In the case of the alfalfa experiments on Plots E, F, G and H, the yield of hay has increased each year since the first crop in 1914. With only a few exceptions, the yield has increased with increased

applications of lime. The maximum yield was 7640 pounds for three cuttings, on Plot G in 1916. The maximum yield in 1914 was 4500 pounds. Attention should also be called to the fact that, with only slight exception, the percentage of nitrogen increased with increased application of lime. For example, the average percentage on Plot E, check plot, in 1916 was 2.45 per cent, while the average percentage on Plot H, with 4000 pounds of ground limestone per acre, was 2.89 per cent.

Lime has also resulted in a larger yield of soybeans per acre and likewise a higher percentage of nitrogen in the beans. Counts were made of the nodules on plants from limed plots and also from unlimed plots, the former giving an average of 83 nodules per plant and the latter 50 nodules per plant. This would appear to strengthen the belief that lime favors those organisms that live in the roots and take nitrogen from the air and may also in part explain the higher percentages of nitrogen in the dry matter from limed plots.

There have been analyzed about one hundred samples of soil from the Freehold Area. The results of these analyses have been put into shape for publication. Also about one hundred and fifty samples of soil from the Camden Area have been analyzed and the results tabulated, but the material has not yet been prepared for publication.

The pot experiments with greensand marl indicate that soybeans at least are able to make a very good growth and form pods with no other potash than that furnished in a slowly available material. However, further work must be done before definite conclusions can be drawn.

#### BOTANY

The work for the past year has been under the three following projects: Heredity, Environment and Toxicology.

Under Heredity, the chief subjects are beans, corn, eggplants, okra, peppers, squashes and tomatoes, and the end sought is a better understanding of the laws of plant breeding. With beans, both crosses and hybrids are considered and of the latter the combination between the garden varieties and the scarlet runner are most promising. These hybrids offer, among other things, an opportunity to study the inheritance of prolificness and of partial sterility.

The work with corn embraces the inheritance of the texture of

the grain between the soft or flour kinds and the sweet and flinty sorts, for which purpose the corn of the Hopi Indians, with its chalky endosperm, is being bred with varieties of pop corn. Attention is being paid to the character of the tassel in its possible correlation with the form of the ear, and attempts are being made to isolate a strain of crossed corn that will show but comparatively few grains upon the normal-sized cob with the hope of determining the behavior of such non-prolific strain in breeding with ordinary corn.

Among eggplants, the breeding is continued between various kinds for the purpose of gaining information as to the behavior of the quality of bitterness in breeding. An absolutely spineless strain seems to be in sight, which may prove of much practical value.

The peppers have been carried forward into the fourth generation and here it is learned that there is a close adherence to type. There is very little indication that the original parental forms are to be obtained, although the number of specimens of a single cross is among the thousands. Still further evidence has been obtained in favor of the opinion that there is some linking together of characters that are common to one or the other of the parents. Work is progressing upon the securing of non-prolific strains for purposes of breeding.

Tomatoes are now being bred chiefly for the purpose of determining whether permanent differences exist between the true reciprocals, and to this end extreme types are being bred and the reciprocal offspring studied along parallel lines.

Under Environment, the work is divided into two groups, that which concerns the position of the part in (or upon) the plant, and, secondly, the difference produced in the plant by varying amounts of heat, light and moisture. A study is in progress as to the relation of position upon the plant to size of pod in peanuts, beans, etc., and associated with this is a consideration of the relation of place in the pod to size of seed. For example, the records show that for scarlet runner the seeds of 2-seeded pods are heavier than those borne in the 3-seeded pods, and the weight decreases quite uniformly as the number of seeds in the pod increases. Experiments are under way to determine whether size of seed is an index of value for plant production. In like manner, it is being shown that the basal seed is the smallest and the one near the tip the largest in the pod.

Researches concerning the physical environment of the plant are chiefly in connection with the greenhouse. In a study of the influence of soil temperature upon seedling corn, it was found that a summer temperature ( $25^{\circ}\text{C.}$ ) as compared with that of late autumn ( $12.50^{\circ}\text{C.}$ ) yields 63 per cent higher viability, while the lower temperature gave three times as much variability in size among the plants.

Under Toxicology, the researches consider the influence of different strengths of four phosphatic salts of calcium, potassium, sodium and ammonium upon seedlings of Wilson soybeans. Associated with this work is a study of the effects of different strengths of single salts in stated amounts upon the germination of several kinds of seed.

The effect of surface films of Bordeaux mixture upon the transpiring powers of tomato leaves has been studied in the open and it was found that the transpiring power of treated leaves is nearly a quarter more than of untreated leaves and is greatest near the middle of the day.

During the past year a new laboratory has been built adjoining the greenhouse, which greatly facilitates the work in plant physiology.

#### ENTOMOLOGY

Investigations are in progress on the influence of atmospheric moisture upon insect metabolism, the methods of controlling the strawberry weevil, apple aphis, false cabbage aphis, pear psylla, the efficiency of certain types of covers for wintering bees, the food preference of the common house or typhoid fly, and the problems connected with mosquito control.

##### *Influence of Atmospheric Moisture upon Insect Metabolism*

Decrease in atmospheric moisture appears to shorten the pupal period in both the bean weevil (*Bruchus obtectus* Say) and the angoumois grain moth (*Sitotroga cerealella* Oliv.) It appears also to shorten the period from beginning to maximum emergence. Decrease in atmospheric moisture appears to shorten the length of adult life in the case of the moth and to lengthen it in the case of the beetle, although the differences in this instance are not very pronounced. Decrease in atmospheric moisture lengthens the period occupied by the life cycle in the case of the bean weevil. It decreases the reproductive ability and when 20 per cent or below ab-

solutely prevents reproduction by destroying the larvæ before they are able to penetrate the beans. The optimum of atmospheric moisture for the bean weevil metabolism from the standpoint of direct effect appears to be very close to 100 per cent but inasmuch as this degree of humidity promotes the growth of destructive fungi the optimum must be placed somewhere between 75 and 100 per cent at a point where the fungi are unable to develop. Storage of beans in an atmosphere with moisture of 20 per cent or less appears to preserve them perfectly from the attack of the bean weevil.

### *Strawberry Weevil*

The rather remarkable results obtained last year in the control of this insect by the use of mixtures of powdered arsenate of lead and sulfur led to a repetition of the dust this year. The experiments were carried out in three different counties and on at least two farms in each case. The work at Cologne on the farm of Mr. William Oeser, because of greater care in the application of the mixtures and in the taking of data, is the one from which the quotations will be given. The varieties concerned are Heritage, Champion and Doris. Check plots were left on each side of each of the plots treated with the mixtures. Three treatments with powdered arsenate of lead 1 part and sulfur 5 parts gave 2442 quarts per acre as compared with an average of 832.5 quarts on the checks. Powdered arsenate of lead 1 part plus sulfur 1 part gave 2604 quarts per acre as compared with an average of 1072 quarts on the checks. Powdered arsenate of lead alone gave 1106 quarts per acre as compared with an average of 763 quarts on the checks. Sulfur alone gave 1313 quarts per acre as compared with an average of 831.5 quarts on the checks. Thus the first mixture is seen to give 1610.5 quarts per acre increase; the second mixture 1532 quarts; the sulfur alone 481.5 quarts and the lead alone 343 quarts. On the basis of 8 cents a quart, the average selling price for good berries in that section, the gain chargeable to the treatments is for the first mixture \$128.84; for the second \$122.57; for the sulfur alone \$38.52 and for the lead alone \$27.44. Inasmuch as the average cost of treatment is about \$4.00 per acre for the first and \$8.00 for the second, the net gain per acre is not far from \$100.00. The results from the 1 to 5 mixture are, of course, the better of the two and both mixtures are much more effective than either of the two substances of which they are composed.

*Apple Aphis*

The species principally concerned is *Aphis sorbi* Kalt. At the orchard of Mr. John H. Barclay near Cranbury the aphis hatched the day before the time the completion of the spraying with winter-strength lime-sulfur would have been necessary to prevent injury to the buds and to prevent the lice from finding shelter against the treatment. At the J. L. Lippincott orchards at Riverton, hatching took place seven or eight days before the same stage of bud development was reached. At the Barclay orchard, it was necessary to apply the winter-strength lime-sulfur before the aphis hatched and to follow the hatching of the aphis with a treatment of tobacco extract, soap and water. At the Lippincott orchards, it was possible to use the winter-strength lime-sulfur together with the tobacco extract. In a set of experiments relating to this matter it was found that the most efficient work followed the application of the winter-strength lime-sulfur during dormancy and the tobacco extract and soap at the green bud stage. It was found also that the use of "Scalecide" after the aphis hatched destroyed 50 per cent of the buds.

*False Cabbage Aphis*

This species was recognized for the first time in New Jersey this fall, but there is evidence to show that it has been present for a number of years and confused with other species. It is a pest of considerable importance on turnips in the Freehold district. It infests the under sides of the leaves and the drooping habit of the turnip plant renders its destruction extremely difficult. An apparatus for lifting the foliage and exposing the louse to a spray of tobacco extract, soap and water was devised and tried out. This apparatus was attached to an Iron Age potato sprayer.

*Pear Psylla*

This species has been troublesome in Kieffer and Bartlett orchards in the southern half of the State. Experiments during the past summer in the J. L. Lippincott orchards at Riverton indicate clearly that the single spray application of winter-strength lime-sulfur just before the flower buds open for destruction of the egg will not control the insect in an entirely satisfactory manner where in the previous year no attempt at control has been made. The results of the experiments also show that three treatments—scrapping,

dormant spray and pre-blossom spray—are effective under these conditions. It may also be said that similar results were obtained in the Richdale orchard at Phalanx, New Jersey, the preceding year.

### *Wintering Bees*

This investigation is concerned with types of insulation. It was found that the C. H. Root cover, which so far as we know was devised and manufactured by Mr. C. H. Root of Red Bank, is more effective in preventing sudden and sharp changes in temperature and large consumption of stores, and in increasing early brood rearing, than the quadruple cover with its much heavier packing. It also appeared that the saving in stores and the increase in brood is ample to pay for a large part of the cost of the case in a single season.

### *Food Preference of the Common House or Typhoid Fly*

(1) Glucose, fructose, galactose, maltose, lactose, sucrose, starch and dextrin were not very attractive to house-flies. Lactose and dextrin caught the largest number of flies, starch the least. Sucrose was consistently a poor bait. (2) The acids and alcohols lured flies in the following order: 4 per cent amylic alcohol (tech); 10 per cent acetic acid; 10 per cent amylic alcohol (tech); 4 per cent ethyl alcohol; 10 per cent ethyl alcohol, and 4 per cent acetic acid. Succinic and lactic acids showed some attractive qualities in two experiments. (3) Maltose, lactose, sucrose and dextrin in 4 per cent solutions of amylic alcohol, ethyl alcohol and acetic acid were more frequently visited by house flies than the corresponding aqueous solutions. Maltose and dextrin solutions were more effective than lactose and sucrose. The order of response to the alcohols and acetic acid was the same as in (2). (4) Crude gluten from wheat flour, consisting largely of gliadin and glutenin, was not attractive. Solutions of the water-soluble portion of wheat flour, with or without the starch in suspension, were decidedly attractive. (5) Several experiments with milk indicate that fat-free caseinogen is attractive while butterfat (ether extract) is not. (6) Experiments suggest that aqueous solutions of molasses to which sodium arsenite and amylic alcohol (tech) are added have considerable value as a poisoned bait for house-flies. The water-soluble portion of wheat flour containing starch in suspension also gave good results with the same additions.

*Mosquito Investigations and Control*

Our salt-marsh drainage methods have been standardized and new ones introduced. In so far as possible the narrow salt-marsh trenching is now laid down in such a fashion that all ditches have strong tidal outlets—no trench is more than one-quarter of a mile in length unless it has more than one outlet—and the trenches are so connected as to form a circulating system. Low-lying and shut-in marshes near large cities of population have been inclosed in substantial dikes and outletted through sluices and tide gates. When the nature of the outlet has demanded it, centrifugal pumps have been installed. A new salt-marsh drainage machine has been invented and the price of ditching thereby materially reduced. The invention is the work of Mr. H. I. Eaton, chief inspector of the Atlantic County Mosquito Commission. Our knowledge of the habits of mosquitos has been increased by (1) the determination of the type of wind on which the salt-marsh species travel—warm winds of high moisture and low velocity (10 miles or less per hour), and (2) the determination of salinity as a factor which governs the geographical distribution of the breeding of the two principal species of salt-marsh mosquitoes—low salinity (8 per cent or less) favoring *A. cantator* and high salinity (12 per cent or more) favoring *A. sollicitans*, and (3) the determination of rather extended migrations of the house mosquito (*C. pipiens*)—the distance covered being in some instances 2.5 miles. Our knowledge of the effect of possible larvicidal substances has been increased by the testing of sodium hydrate, sodium sulpho-carbonate, borax, copper sulfate, iron sulfate, pyrethrum, nicotine quassia, hellebore, ginger, pyroligneous acid, carbo-sul, pyridine, cresol, lysol, phenol (crude), a mixture of pyridine, xylol and rosin, and differing samples of oils furnished for the purpose by the Standard Oil Company. Five hundred thousand linear feet of salt-marsh ditching has been thoroughly cleaned and the obstructions removed from all of the rest on the Atlantic Coast. The State Experiment Station has completed the cutting of 745,105 linear feet of new salt-marsh ditching and the counties have cut 2,543,713 linear feet of salt-marsh ditching. These counties have patrolled approximately 95,000 acres of salt-marsh throughout the last mosquito-breeding season, covering a coast line of 125 miles. They have patrolled approximately 314,000 acres of upland, destroying the fresh-water mosquito breeding as it was found. They have afforded a good measure of protection to one

and three-fourths millions of people. The total cost of the operation, aside from the work done by the State Experiment Station, which was paid for mainly from last year's funds, is less than \$216,000.

Our project list is as follows: mosquito investigations; soil-infesting insect investigations; peach borer investigations; potato flea beetle investigations; climate and insect investigations; strawberry weevil investigations; hickory bark beetle investigations; orchard plant lice investigations; house or typhoid fly investigations and miscellaneous investigations. Under miscellaneous investigations, we have included false cabbage aphis, the pear psylla and bee wintering. It is proposed, in the future, to follow certain especially important lines, such as climate and insect, mosquito and house-fly studies from year to year and to go into the phenomena connected therewith to the greatest possible extent, and at the same time to investigate certain phases of the more seriously injurious species at the particular time that they are most abundant. All investigations, except those relating to mosquitoes, are supported with the Hatch funds.

#### PLANT PATHOLOGY

During the past year the correspondence of the department has been very heavy and it has been impossible to do as much in the way of field work as in preceding years. The attention of the department has been called to 225 diseases of agricultural crops, some of which are of considerable importance. The experimental work has been along the following lines:

1. Work has been continued on the influence of sulfur in the control of potato scab. This work has been supported by a fellowship established by the Union Sulphur Company of New York City. The fellowship has expired and the work has been discontinued. The results indicate that the application of sulfur to the soil is beneficial under certain conditions, especially those in which it is desirable to continue the planting of potatoes in the same soil year after year. The results of this work for the past year will be incorporated in the annual report and the results for the past three years in a manuscript for a bulletin. A resumé of the results will be published as a circular of the Station.

2. A long series of experiments has been conducted on the treatment of foliage diseases of potatoes. The results in different parts of the State are extremely variable, but it appears that spray-

ing of the late crop of potatoes in South Jersey can usually be carried on with profit. The results of this work for the past year also will be submitted in circular form.

3. The department has conducted a number of experiments with diseased and healthy seed potatoes at the College Farm, the seed having been furnished by the Maine Agricultural Experiment Station, the United States Department of Agriculture and from many sources in New Jersey. This line of work should be continued for a number of years.

4. Experiments are being conducted on the control of the various diseases of the celery in Bergen County. These experiments have involved soil sterilization, and, while the results are very promising, the importance of the celery crop in New Jersey is such as will justify a much more extended line of experimental work.

5. Experimental work is also in progress on the control of the foliage diseases of celery and the results have been very gratifying.

6. Studies are being made on the control of foliage diseases of tomatoes at Salem, New Jersey. This work is in cooperation with the United States Bureau of Plant Industry and the H. J. Heinz Company. The results are encouraging, but many difficulties, beyond control, seriously interfered with the work. The tomato industry is of very great importance, and the control of the disease is the most important factor in tomato production at the present time. The nature of these diseases is such that it will probably require a long period of study to solve satisfactorily the problems in hand. It is very probable that arrangements may be made for a continuation of this work in cooperation with the United States Bureau of Plant Industry.

7. For a short period last summer the department continued its studies of the brown blotch of the pear. Very interesting data have been accumulated and it is recommended that arrangements be made whereby similar studies may be carried on in the summer of 1917.

8. A manuscript on the parasitic fungi of New Jersey is almost ready for publication. The work will be continued from year to year with the idea of publishing supplements either as independent bulletins or as a part of the annual report.

Many studies have been made of problems, the results of which will be published from time to time.

*Epidemics*

Several plant diseases which are discussed below have been of sufficient importance to be classed as epidemics.

Peach yellow and little peach were much more severe than for many years past. It is to be regretted that it has been found necessary to discontinue the distribution of the bud wood to the nurserymen of the State. It is believed that there is no better method of controlling this disease than for the State to furnish bud wood from healthy trees to the nurserymen and, where possible, to the growers.

The mosaic disease of tomatoes has been exceptionally severe, and was undoubtedly a great factor in the reduction of the yield.

Mosaic disease of peppers was very severe, but its importance is not recognized by many growers.

Mosaic, leaf roll and Rhizoctonia of the potato were the cause of heavy losses.

The early blight of the celery was the cause of heavy loss in celery-growing localities.

Fire blight of the apple and pear was epidemic, but not so severe as in 1915.

Many complaints have been received concerning trouble with shade trees, but, for lack of assistance, these problems could not be investigated.

*Problems for 1917*

The following are some of the problems with which the department will be concerned in 1917.

1. A continuation of the study of diseases carried in seed potatoes (Plot work at the College Farm).
2. Diseases of tomatoes.
3. Diseases of celery.
4. Injurious effect of fungi on paints.
5. Diseases of ornamental plants.
6. Diseases of orchard crops, especially the brown blotch of the pear.
7. Crown gall and other abnormal root growths.
8. Soil sterilization.
9. Diseases of beans along the line of developing resistant strains.

*Needs of the Department*

The demands of farmers for personal inspections of growing crops and the heavy correspondence make it desirable that an associate plant pathologist be appointed. He should be in a position to carry on a considerable amount of this work. He should be especially interested in truck crops, as these will demand a great deal of attention in the very near future. There is also need for a well trained man, capable of distinguishing diseases which have very similar symptoms, but which require different treatments, to direct demonstration work. Such a man would keep in close touch with the problems of the State and would prevent many failures which are now the result of a confusion of diseases which present similar external symptoms. He would also tabulate the results of the control work through the State in a way that would be advantageous to all parties concerned.

The necessity for study on diseases of tomatoes and eggplants is very urgent.

*Inspection Work*

The inspection work under the direction of the State Department of Agriculture has been very satisfactory. The most important development in this line of work has been the finding of the blister rust of the white pine in New Jersey. It would now appear that the situation is well in hand, but the conditions in other states lead the writer to believe that the white pine will be wiped out in the same manner as the chestnut forests.

## THE EXPERIMENT STATION LIBRARY

The Experiment Station Library is conducted as a branch of the Rutgers College Library. There are now approximately 5,000 bound volumes in the library, and a large amount of unbound material in the form of bulletins, circulars and reports of the various experiment stations and of the United States Department of Agriculture, as well as the leading scientific journals relating to agriculture, current farm papers and periodicals, newspapers of the State and various other publications. An effort is made to keep two complete files of the publications of the state experiment stations, the state departments of agriculture and the United States Department of Agriculture. Considerable time has been spent in an effort to secure missing numbers to complete the files up to date

preparatory to having the various series bound. About 300 volumes of these bulletins, circulars and reports have been bound during the past year. At present there is an equivalent of about 500 volumes of unbound material of this class alone awaiting completion before sending to the binders. Acknowledgement is due the directors and librarians of the different experiment stations who have so readily cooperated in furnishing publications which were missing from the files. Also, a large number of unbound publications which were needed to complete some sets were presented to the Library by Dr. Jacob G. Lipman, Dr. Byron D. Halsted, Mr. James Neilson and the late Dr. Julius Nelson. The State Department of Agriculture contributed over 100 bound volumes of various reports and some valuable unbound bulletins.

An effort has been made to complete the various sets of live stock record books; and, through the courtesy of the different record associations, a number of sets have been completed to date and others added to materially. A new card index of the publications of the United States Department of Agriculture was purchased. Considerable unbound material was moved from the College Library and is being arranged for use.

The library records show that approximately 800 volumes and unbound publications were loaned during the year. About 75 volumes were borrowed from the Library of the United States Department of Agriculture and the Library of Congress, Washington, D. C., for the use of the experiment station workers.

The library is now badly overcrowded and more space is needed. Also, before the library can be put upon an efficient working basis, much work needs to be done in completing sets, binding and cataloging. This cannot be done without the expenditure of more funds for purchasing missing publications, for binding and for the employment of additional clerical help.

## PUBLICATIONS

Aside from bulletins, circulars and other publications of the Station, members of the staff prepared technical and popular papers for agricultural journals and magazines. The following list is complete as to the Station publications proper, but incomplete as to papers published elsewhere.

*Bulletins*

287. Analyses and Valuations of Commercial Fertilizers and Ground Bone.  
Analyses of Agricultural Lime.
288. Investigations Relative to the Use of Nitrogenous Plant-Foods, 1898-1912.
289. Cylinder Experiments Relative to the Utilization and Accumulation of Nitrogen.
290. Fertilizer Registrations for 1916.
291. The Influence of the Tannin Content of the Host Plant on Endothia Parasitica and Related Species.
292. The Response of the House-Fly (*Musca domestica* L.) to Ammonia and Other Substances.
293. Effect of Pruning Peach Trees at Different Heights Previous to Planting in the Orchard.
294. Farm Profits and Factors Influencing Farm Profits on 370 Potato Farms in Monmouth County, N. J.
295. Commercial Feeding Stuffs and Registrations for 1916.
296. The More Important Greenhouse Insects.
297. Analyses of Commercial Fertilizers, Fertilizer Supplies and Home Mixtures.

*Circulars*

49. Management of the Farm Poultry Flock.
50. Common Diseases of Beans.
51. Diseases of Grains and Forage Crops.
52. Common Diseases of the Pear.
53. Potato Diseases in New Jersey.
54. Improving Acid Soils.
55. Common Diseases of the Grape.
56. The Strawberry Weevil.
57. Asparagus.
58. Suggested Grades for Peaches.
59. The New Jersey Seed Law.
60. Weed Control.
61. The Agricultural Value of Greensand Marl.
62. Digest and Copy of Law Regulating the Weighing, Testing and Purchasing of Milk and Cream, being Chapter 31, Laws of 1916.

### *Reports*

Thirty-Sixth Annual Report New Jersey State Agricultural Experiment Station and Twenty-Seventh Annual Report New Jersey Agricultural College Experiment Station.

### *Hints to Poultrymen*

The Experiment Station has also issued during the year the monthly publications "Hints to Poultrymen," Vol. 4, No. 2-12, and Vol. 5, No. 1.

### *Extension Bulletins Published by the State Agricultural College*

Vol. 1, No. 8. Second Annual Report of the Division of Extension for the year ending October 31, 1915.

Vol. 1, No. 9. Announcement of Educational Milk-Scoring Demonstrations.

### *News Letters*

The Weekly News Letter, Vol. 3, Nos. 1 to 52, was published during the year by the Extension Division of the State Agricultural College.

### *Technical Papers*

"Factor's Influencing the Protein Content of Soybeans." J. G. Lipman and A. W. Blair. Soil Science, Vol. 1, No. 2; February, 1916.

"Yield and Nitrogen Content of Soybeans as Affected by Inoculation." J. G. Lipman and A. W. Blair. Soil Science, Vol. 1, No. 6; June, 1916.

Review of Soil Bacteria and Soil Fertility by F. Löhnis. J. G. Lipman. Journal of the American Chemical Society; April, 1916.

"Influence of Lime on the Yield and Nitrogen Content of Corn." A. W. Blair and H. C. McLean. Soil Science, Vol. 1, No. 5; May, 1916.

"The Actinomycetes of the Soil." S. A. Waksman and R. E. Curtis. Soil Science, Vol. 1, No. 2; February, 1916.

"The Oxidation of Sulfur in Soils as a Means of Increasing the Availability of Mineral Phosphates." J. G. Lipman, H. C. McLean and H. C. Lint. Soil Science, Vol. 1, No. 6; June, 1916.

"Incubation Studies with Soil Fungi." S. A. Waksman and R. C. Cook. Soil Science, Vol. 1, No. 3; March, 1916.

"Bacterial Numbers in Soils at Different Depths and Different Seasons of the Year." S. A. Waksman. Soil Science, Vol. 1, No. 4; April, 1916.

"Soil Fungi and Their Activities." S. A. Waksman. Soil Science, Vol. 2, No. 2; August, 1916.

"Protozoa as Affecting Bacterial Activities in Soil." S. A. Waksman. Soil Science, Vol. 2, No. 4; October, 1916.

"Effect of Grinding on the Lime Requirement of Soils." R. C. Cook. Soil Science, Vol. 1, No. 1; January, 1916.

"Quantitative Media for the Estimation of Bacteria in Soils." R. C. Cook. Soil Science, Vol. 1, No. 2; February, 1916.

"Diastase Activity and Invertase Activity of Bacteria." George P. Koch. Soil Science, Vol. 1, No. 2; February, 1916.

- "Can Soil be Sterilized Without Radical Alteration?" David A. Coleman, H. Clay Lint and Nicholas Kopeloff. *Soil Science*, Vol. 1, No. 3; March, 1916.
- "The Inoculation and Incubation of Soil Fungi." Nicholas Kopeloff. *Soil Science*, Vol. 1, No. 4; April, 1916.
- "The Effect of Soil Reaction on Ammonification by Certain Soil Fungi." Nicholas Kopeloff. *Soil Science*, Vol. 1, No. 6; June, 1916.
- "Environmental Factors Influencing the Activity of Soil Fungi." David A. Coleman. *Soil Science*, Vol. 2, No. 1; July, 1916.
- "Preliminary Investigations in Comparison of Field with Laboratory Experiments in Soil Biology." George P. Koch. *Soil Science*, Vol. 2, No. 1; July, 1916.
- "Sources of Error in Soil Bacteriological Analysis." H. C. Lint and David A. Coleman. *Soil Science*, Vol. 2, No. 2; August, 1916.
- "Studies on the Activity of Soil Protozoa." George P. Koch. *Soil Science*, Vol. 2, No. 2; August, 1916.
- "Sulfur on Alkali Soils." J. G. Lipman. *Soil Science*, Vol. 2, No. 3; September, 1916.
- "Some Bacteriological Studies on Agar Agar." Carl R. Fellers. *Soil Science*, Vol. 2, No. 3; September, 1916.
- "Factors Affecting the Absorption and Distribution of Ammonia Applied to Soils." R. C. Cook. *Soil Science*, Vol. 2, No. 4; October, 1916.
- "The Influence of Various Salts on the Growth of Soybeans." J. W. Shive. *Soil Science*, Vol. 1, No. 2; February, 1916.
- "The Influence of the Tannin Content of the Host Plant on Endothia Parasitica and Related Species." M. T. Cook and G. W. Wilson. *Botanical Gazette*, November, 1915.
- "The Influence of Ether on the Growth of Endothia." M. T. Cook and G. W. Wilson. *Botanical Gazette*, November, 1915.
- "The Pathology of Ornamental Plants." M. T. Cook. *Botanical Gazette*, November, 1915.
- "Two Interesting Diseases of Greenhouse Tomatoes." M. T. Cook and C. A. Schwarze. *Phytopathology*, August, 1916.
- "The Study of Plant Diseases in the High School." M. T. Cook. *School Science and Mathematics*, Vol. 16, 1916.
- "Sulphur-Arsenical Dusts Against the Strawberry Weevil." T. J. Headlee. *Jour. Econ. Ent.*, Vol. 9, No. 1; 1916.
- "The Value of Experimental Study to the Practical Work of Mosquito Control." T. J. Headlee. *Proceedings of the Third Ann. Meeting of the N. J. Mos. Extermination Assn.*, 1916.
- "Fruit Insects of the Year." T. J. Headlee. *Proceedings of the N. J. State Hort. Soc.*; 1915.
- "A Chemotropic Response of the House-fly." C. H. Richardson. *Science*, Vol. 44, No. 1113; 1916.
- "Attraction of Diptera to Ammonia." C. H. Richardson. *Ann. Ent. Soc. Amer.*; December, 1916.

- "The Influence of Various Concentrations of Sea Water on the Viability of the Salt Marsh Mosquitoes, *Aedes sollicitans* and *Aedes Cantator*. F. E. Chidester and R. S. Patterson. Ent. News; June, 1916.
- "Notes on *Leptopypha mutica* Say." H. B. Weiss. Ent. News; July, 1916.
- "The Distribution of the Periodical Cicada in New Jersey." H. B. Weiss. Ent. News; October, 1916.
- "*Monarthropalpus buxi* in New Jersey." H. B. Weiss. Psyche; October, 1916.
- "The Ash Bug, *Neoborus amoenus*." H. B. Weiss. Jour. N. Y. Ent. Soc.; December, 1916.
- "Additions to Insects of New Jersey, No. 3." H. B. Weiss. Ent. News; January, 1916.
- "Additional Records of New Jersey Acarina." H. B. Weiss. Ent. News; March, 1916.
- "Foreign Insects Recently Established in New Jersey." H. B. Weiss. Jour. Econ. Ent.; February, 1916.
- "The Coccidae of New Jersey Greenhouses." H. B. Weiss. Psyche; February, 1916.
- "The Insect Fauna of New Jersey Greenhouses, Exclusive of Coccidae." H. B. Weiss. Jour. N. Y. Ent. Soc.; June, 1916.
- "Additions to Insects of New Jersey, No. 4." H. B. Weiss. Ent. News; April, 1916. Nineteen notices of various species also were published.
- "Distinctive Marks of American and European Foul Brood of Bees." E. G. Carr. Amer. Bee Jour.; February, 1916.

#### Popular Articles

- "Greatest Need of Eastern Agriculture." J. G. Lipman. Pennsylvania Farmer, December 15, 1915.
- "How Often to Inoculate." J. G. Lipman. Country Gentleman, November 20, 1915.
- "Potash in Cottonseed Meal." J. G. Lipman. Country Gentleman, April 8, 1916.
- "Soil Fermentation and the Feeding of Crops." J. G. Lipman. Rural New Yorker, 1916.
- "Fertilizers for Fruit Orchards." J. G. Lipman. Proc. Mass. State Hort. Soc., 1916.
- "The Fertilizer Problem in New Jersey." J. G. Lipman. Ann. Rpt. N. J. State Bd. of Agr., 1916.
- "Political and Economic Consideration in Mosquito Extermination Work." J. G. Lipman. Proc. N. J. Mosquito Extermination Assn., 1916.
- "The Potash Situation and Notes from the West." J. G. Lipman. Proc. N. J. State Hort. Soc., 1916.
- "Picking, Packing and Shipping Peaches, Part I." M. A. Blake. Rural New Yorker, July 15, 1916.
- "Picking, Packing and Shipping Peaches, Part II." M. A. Blake. Rural New Yorker, July 22, 1916.

- "Picking, Packing and Shipping Peaches, Part III." M. A. Blake. Rural New Yorker, July 29, 1916.
- "Picking, Packing and Shipping Peaches, Part IV." M. A. Blake. Rural New Yorker, August 5, 1916.
- "Picking, Packing and Shipping Peaches, Part V." M. A. Blake. Rural New Yorker, August 12, 1916.
- "Picking, Packing and Shipping Peaches, Part VI." M. A. Blake. Rural New Yorker, August 19, 1916.
- "Top-Working Peach Trees, Part I." M. A. Blake. Rural New Yorker, March 4, 1916.
- "Top-Working Peach Trees, Part II." M. A. Blake. Rural New Yorker, March 11, 1916.
- "Forty Years of History." M. A. Blake. Proc. N. J. State Hort. Soc., 1915.
- "Culture of the Strawberry." M. A. Blake. The Field, June, 1916.
- "Dynamite and Fruit Trees." A. J. Farley. The Field, November, 1915.
- "Planting an Apple Orchard." A. J. Farley. The Field, December, 1915.
- "Pointers for Pruning Apple Trees." A. J. Farley. The Field, February, 1916.
- "Spraying Peaches." A. J. Farley. Proc. State Hort. Soc. Pa., 1916.
- "Harvesting, Packing and Marketing the Peach." A. J. Farley. Proc. State Hort. Soc. Pa., 1916.
- "Rules and Methods for Judging Apples." A. J. Farley. Peninsula Hort. Soc. Rpt., 1916.
- "The Swine Industry in New Jersey." F. C. Minkler. N. J. Dept. Agr., Bul. 1, November, 1916.
- "The A. B. C. of Feeding." F. C. Minkler. The Field, February, 1916.
- "Problems in Pork Production." F. C. Minkler. Berkshire World, March, April and May, 1916.
- "Show Ring Publicity." F. C. Minkler. Guernsey Breeders' Journal, September, 1916.
- "Limiting Factors in Pork Production." F. C. Minkler. Duroc-Jersey Bulletin and the Berkshire World, January, 1916.
- "Calculating Feed Values." L. S. Riford. Hoard's Dairyman, December 3, 1916.
- "Corn and Alfalfa." L. S. Riford. Hoard's Dairyman, February 25, 1916.
- "Suitable Litters for Laying Houses." W. C. Thompson. Everybody's Poultry Magazine, November, 1915.
- "The Breeding Pen for the Egg Farmer." W. C. Thompson. Everybody's Poultry Magazine, December, 1915.
- "Advertising Poultry Products." W. C. Thompson. Everybody's Poultry Magazine, January, 1916.
- "The Incubator Cellar." W. C. Thompson. Everybody's Poultry Magazine, February, 1916.
- "Babes in Chickland." W. C. Thompson. Everybody's Poultry Magazine, March, 1916.
- "Spring Ranges for Poultry." W. C. Thompson. Everybody's Poultry Magazine, April, 1916.

- "Fields for Chickens." W. C. Thompson. Everybody's Poultry Magazine, May, 1916.
- "Colony Houses for Use on the Summer Range." W. C. Thompson. Everybody's Poultry Magazine, June, 1916.
- "The Three S's in Successful Range-Chick Growth." W. C. Thompson. Everybody's Poultry Magazine, July, 1916.
- "The Man in the Chicken Business." W. C. Thompson. Everybody's Poultry Magazine, August, 1916.
- "Why Keep Records This Year?" W. C. Thompson. Everybody's Poultry Magazine, September, 1916.
- "Diseases—Prevent Them This Winter." W. C. Thompson. Everybody's Poultry Magazine, October, 1916.
- "The Poultry Drug Shop." H. R. Lewis. Country Gentleman, November, 1915.
- "City Chickens." H. R. Lewis. Country Gentleman, October, 1915.
- "Making a Living from the Poultry Flock." H. R. Lewis. Eugene McGuckin Co., Magazine Edition Sunday Papers, November 24, 1915.
- "Evolution and Possibilities of the Day-Old Chick Industry." H. R. Lewis. Eugene McGuckin Co., Magazine Edition Sunday Papers, February 19, 1916.
- "Securing a Supply of Cheap Eggs in Winter." H. R. Lewis. Eugene McGuckin Co., Magazine Edition Sunday Papers, March 6, 1916.
- "Maintaining a Healthy Flock." H. R. Lewis. Everybody's Poultry Magazine, November, 1915.
- "Increasing the Quality of Market Eggs." H. R. Lewis. Everybody's Poultry Magazine, December, 1915.
- "The February-Hatched Pullet." H. R. Lewis. Everybody's Poultry Magazine, January, 1916.
- "Producing Quality Chicks." H. R. Lewis. Everybody's Poultry Magazine, February, 1916.
- "Operating the Colony Brooder Stove." H. R. Lewis. Everybody's Poultry Magazine, March, 1916.
- "Meat, Milk and Bone." H. R. Lewis. Everybody's Poultry Magazine, April, 1916.
- "That Summer Range." H. R. Lewis. Everybody's Poultry Magazine, May, 1916.
- "Summer Greens on Restricted Range." H. R. Lewis. Everybody's Poultry Magazine, June, 1916.
- "Every Inch a Hen." H. R. Lewis. Everybody's Poultry Magazine, July, 1916.
- "Playing the Hen Game." H. R. Lewis. Everybody's Poultry Magazine, August, 1916.
- "Breeding the Heavy Layers." H. R. Lewis. Everybody's Poultry Magazine, September, 1916.
- "Quality Poultry Meat." H. R. Lewis. Everybody's Poultry Magazine, October, 1916.

- "The Problem of the Poultry Feeder." H. R. Lewis. *The Field*, November, 1915.
- "The Utility and Fancy in the Poultry Game." H. R. Lewis. *The Field*, December, 1915.
- "The Art and Science of Artificial Hatching." H. R. Lewis. *The Field*, March, 1916.
- "The Mother Hen's Rival." H. R. Lewis. *The Field*, April, 1916.
- "America's Premier Fowl, the Barred Plymouth Rock." H. R. Lewis. *The Field*, June, 1916.
- "Keeping the Poultry Flock Healthy." H. R. Lewis. *The Countryside Magazine*, November, 1915.
- "Owning a Poultry Flock of Your Own." H. R. Lewis. *The Countryside Magazine*, January, 1916.
- "Feeding the Laying Hen." H. R. Lewis. *The Countryside Magazine*, February, 1916.
- "Efficiency in Roaster Production." H. R. Lewis. *Journal of American Association of Instructors and Investigators of Poultry Husbandry*, March, 1916.
- "Meat Scrap in the Laying Ration." H. R. Lewis. *Journal of American Association of Instructors and Investigators of Poultry Husbandry*, April, 1916.
- "Sour Milk for Laying Hens." H. R. Lewis. *Journal of American Association of Instructors and Investigators of Poultry Husbandry*, June, 1916.
- "Cottonseed Meal in the Poultry Ration." R. F. Irvin. *Southern Agriculturist*, January 12, 1916.
- "Marketing Eggs in the South." R. F. Irvin. *Southern Agriculturist*, May 3, 1916.
- "Relation of Moisture to a Successful Hatch." R. F. Irvin. *Everybody's Poultry Magazine*, April, 1916.
- "Summer Ranges for Chickens." R. F. Irvin. *Rural New Yorker*, May 20, 1916.
- "The Capon—An Outlet for Surplus Cockerels." R. F. Irvin. *Everybody's Poultry Magazine*, June, 1916.
- "The Leghorn Broiler." R. F. Irvin. *Country Gentleman*, June 10, 1916.
- "Gape Worms in Chickens." R. F. Irvin. *Farm and Fireside*, June 6, 1916.
- "The Capon on the Farm." R. F. Irvin. *Pennsylvania Farmer*, August, 1916.
- "Fall House Cleaning of the Poultry Plant." R. F. Irvin. *Pennsylvania Farmer*, September 30, 1916.
- "Poultry Equipment Which Can be Made at Home." V. G. Aubry. *The Field*, March, 1916.
- "Fertilizing Sweet Potatoes." R. W. DeBaun. *Pennsylvania Farmer*, April 15, 1916.
- "The Canhouse Tomato Crop." R. W. DeBaun. *Pennsylvania Farmer*, June 10, 1916.
- "How to Prepare Vegetables for Exhibition Purposes." R. W. DeBaun. *Pennsylvania Farmer*, August 5, 1916.

- "Growing Peas and Beans for Canneries." R. W. DeBaun. Pennsylvania Farmer, August 19, 1916.
- "Increasing Potato Yields." R. W. DeBaun. Pennsylvania Farmer, October 7, 1916.
- "New Methods of Growing Everbearing Strawberries." R. W. DeBaun. Pennsylvania Farmer, October 7, 1916.
- "Labor Saving Methods." R. W. DeBaun. Country Gentleman, July 22, 1916.
- "Gathering the Root Crop." R. W. DeBaun. Country Gentleman, October 29, 1916.
- Series on "Spinach for Fall and Winter Use." R. W. DeBaun. Rural New Yorker, September, 1916.
- "Advantages of Garden Peas." R. W. DeBaun. Rural New Yorker, May 6, 1916.
- "Late Cauliflower." R. W. DeBaun. Rural New Yorker, May 6, 1916.
- "Cantaloupe Growing." R. W. DeBaun. American Agriculturist, April 22, 1916.
- "Treatment of Cabbage Seed." R. W. DeBaun. American Agriculturist, April 29, 1916.
- "Fall Work With Truck." R. W. DeBaun. American Agriculturist, October 21, 1916.
- "New Jersey Notes" are run in every issue of the Market Growers' Journal, by R. W. DeBaun, to increase the interest of the New Jersey vegetable growers in cooperation, extension work and agricultural advancement.

## THE STATION STAFF

### *Resignations*

Frank C. Ashbolt, Assistant Herdsman, Dairy Department.  
 Samuel I. Hoddeson, Assistant Chemist.  
 Joseph J. Williams, Microscopist.  
 Henry H. Brehme, Field Assistant, Mosquito Work.  
 Arthur C. Foster, Assistant Seed Analyst.  
 Homer E. Carney, Assistant Seed Analyst.  
 Joseph Gargano, Helper, Floriculture Department.  
 S. A. Waksman, Research Assistant.  
 William S. Porte, Research Assistant.  
 Charles H. Richardson, Jr., Assistant Entomologist.

### *Transfers*

John W. Bartlett, transferred from Horticultural Department to Extension Department.  
 Lawrence G. Gillam, transferred from Horticultural Department to Extension Department.

*Appointments*

Joseph Hadley, Assistant Herdsman, Dairy Department.  
Louis J. Kleinfeld, Assistant Chemist.  
Frank O. Fitts, Assistant Chemist.  
D. James Kay, Assistant Chemist.  
Ralph M. Hubbard, Field Assistant.  
Paul J. Sassi, Field Assistant.  
Herman J. Levine, Assistant in Vegetable Gardening.  
David Schmidt, Field Assistant.  
Franklin O. Church, Research Assistant.  
Fidel P. Schlatter, Research Assistant.  
Thurlow C. Nelson, Assistant Biologist, Oyster Work.  
P. C. Cameron, Laboratory Assistant, Oyster Work.  
J. Richard Nelson, Laboratory Assistant, Oyster Work.  
Miss Nevada S. Evans, Assistant Seed Analyst.  
George Smith, Helper, Floriculture Department.  
J. R. Neller, Research Assistant.  
Alvah Peterson, Assistant Entomologist.

The Station has suffered a great loss through the unexpected death of Dr. Julius Nelson, which occurred on February 15, 1916. Dr. Nelson served for many years as Biologist of the Station, and in this capacity carried on important research. The results of his investigations form a distinct addition to our knowledge of oyster propagation and oyster culture. His loss is keenly felt by his associates.

Mr. D. Manley Jobbins, in charge of the greenhouses of the Station since September 1, 1908, died suddenly on November 9, 1916. Mr. Jobbins was an unusually faithful and efficient employee. His loyalty and service were highly prized and his untimely death is regretted by all who knew him.



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Ag. Serv.

THE INFLUENCE OF SALINITY OF THE DEVELOPMENT OF CERTAIN SPECIES OF MOSQUITO LARVAE AND ITS BEARING ON THE PROBLEM OF THE DISTRIBUTION OF SPECIES.

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NEW JERSEY

AGRICULTURAL

**Experiment Stations**

BULLETIN 299

NEW BRUNSWICK, N. J.

# NEW JERSEY AGRICULTURAL EXPERIMENT STATIONS

New Brunswick, N. J.

## 1. STATE STATION, ESTABLISHED 1880.

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John R. Hartung.....Jersey City.

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HERBERT P. ROOD, Sampler and Assistant.  
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FANNIE F. COOPER, B. S.,  
State Leader in Girls' Club Work.

WILLIAM J. CARSON, B. S. A.,  
Dairy Husbandman.  
LLOYD S. RIFORD, M. Sc.,

Assistant Dairy Husbandman.

CHARLES VAN NUIS, Associate in Farm Crops.

HARRY C. McLEAN, B. Sc.,  
Chemist, Soil Research.

FRANK APP, B. Sc., Agronomist.  
THOMAS J. HEADLEE, Ph. D., Entomologist.  
CHARLES S. BECKWITH, B. Sc.,

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NEVADA S. EVANS, A. M.,  
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MAURICE A. BLAKE, B. Sc., Horticulturist.

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Specialist in Fruit Studies.  
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RALPH M. HUBBARD, B. Sc., Field Assistant.

DAVID SCHMIDT, B. Sc., Field Assistant.  
PAUL J. SASSI, Field Assistant.  
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# NEW JERSEY

## AGRICULTURAL EXPERIMENT STATIONS

### BULLETIN 299

#### THE INFLUENCE OF SALINITY ON THE DEVELOPMENT OF CERTAIN SPECIES OF MOSQUITO LARVAE AND ITS BEARING ON THE PROBLEM OF THE DISTRIBUTION OF SPECIES<sup>1</sup>

By

F. E. Chidester, Ph. D.

#### INTRODUCTION

In the course of an extensive study of the activity of the killifishes of the New Jersey coast, it was deemed desirable to obtain records of the salinity, specific gravity and temperature of the water from which each collection was made. In the course of such record taking it was noted that considerable differences in salinity existed in pools which contained mosquito larvæ.

On April 18, 1915, two series of experimental jars were set up in one of the laboratories of the Entomology Building. The first series consisted of 11 jars. The series began with 100 c. c. of sea water from the Raritan Bay, with a salinity of 13 per cent and ran down by steps of 10-c. c. dilution with distilled water to pure distilled water in the eleventh jar. The object of this experiment was to determine what changes would take place in the larvæ of salt-marsh mosquitoes taken from pools with a degree of salinity of about 7 or 8 per cent and forced to develop in water of a low salinity. The intention was also to subject *Culex pipiens* Linn. to a saline medium and to try to change it into a salt-water species. The second series was composed of boiled down sea water, graduated in series by eight steps from 16 to 35 per cent salinity. In this experiment the object was to determine what was the minimum toxic strength of salinity for the species used. The two series were supplemented by controls and by two jars of a 50-50 mixture of 13 per cent sea water and distilled water, placed at two different temperatures, one kept low by running water (53°F.) the other placed in the greenhouse where the temperature ran up to 75°F. at times. The jars were covered with cheese cloth after having been supplied with 5 second-moult and 10 first-moult larvæ of the mosquito *Aedes cantator* Coq. In the preparation of these experiments the writer was aided by Mr. Raymond S. Patterson, who not only determined the species, but aided in preparing the jars of solution.

In the series running down from 13 per cent it was noted that

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1. Contribution from the entomological laboratory; Thomas J. Headlee, Ph. D., Entomologist.

the larvæ died rather quickly in the distilled water and in the higher percentages. In the series graduated from 16 per cent up to 35 per cent salt, all larvæ died in the 22 per cent jar in two days. Just as the records of these preliminary experiments were being considered and plans were being made for a more extensive series, the writer was invited by Mr. Patterson to go on a collecting trip to Port Monmouth. On this trip Mr. Patterson and the writer took salinities of many pools, including some which contained no larvæ. Two pools in particular engaged our attention. One with a temperature of 64° F. and a salinity of 22 per cent contained larvæ of the species *Aedes sollicitans* Wlk. of the second moult; the other pool not ten feet away and similar in size, depth and character of bottom, with a temperature of 67° F. and a salinity of 24 per cent contained no larvæ at all. As there was no evidence of the presence of larvæ of any sort or of efficient natural enemies in the second pool, the observation seemed important, particularly in the light of the preliminary experiments performed in the laboratory. Accordingly, Mr. Patterson and the writer decided to carry on a large series of experiments to discover the effects of high salinity on the viability of mosquito larvæ at different stages. Mr. Patterson was shortly forced to discontinue his work with the writer, but has aided substantially by furnishing larvæ and field notes as well as by advice and information.

On receiving the report of these findings, Dr. T. J. Headlee, entomologist of the New Jersey Agricultural Experiment Station, immediately saw the possible bearing on species distribution and the problem of mosquito extermination and arranged to have his inspectors secure temperature and salinity records of the distribution of the mosquito larvæ throughout the state.

#### MATERIAL AND METHODS

In conducting the experimental work it was found desirable to confine the work largely to the two dominant species of salt-marsh mosquitoes, *Aedes sollicitans* Wlk. and *Aedes cantator* Coq. Several experiments were performed with other species, including *Culex salinarius* Coq., *Aedes sylvestris* Theob., and *Culex pipiens* Linn.

As material was brought into the laboratory, the field records of temperature, salinity and condition of the pools were tabulated by Mr. F. E. Mehrhof. Species were determined usually by an assistant in the entomological laboratory, Mr. W. H. W. Komp. The larvæ of different species were separated according to age and species and placed in jars of salt water of the proper salinity to agree most nearly with their source. To the salt-water jars were usually added small quantities of the original water, in order to keep up the faunal and floral food supply. The jars were covered with cheese cloth to keep out dirt and to prevent the escape of adult mosquitoes.

For experimental purposes, jars 3 3/4 inches in diameter and

6 3/4 inches in height were chosen. In each of these was placed 200 c. c. of the solution to be used. In the case of the various short series of salt water used as preliminary and as final checks on the experiments the graduations were from 4 per cent salinity to 35 per cent or 40 per cent salinity by rather widely separated steps. Other short series ran from 4 per cent salinity to 13 per cent or 14 per cent salinity. In the long series which was run for all the species of larvæ at least once, and for certain of them at least twice, 22 jars were used. The first 21 jars contained 200 c. c. of water graduated from c. c. of the stock solution of 40 per cent salinity, by 10-c. c. differences down to the stock solution of 200 c. c. of distilled water, redistilled through a glass condenser. The 22nd jar contained 200 c. c. of control water, usually from the original solution, always from the jar in which the larvæ were flourishing when the experiment was begun. In the long series the salinities varied between 2 and 3 per cent in difference of salinity from the 40 per cent down to the distilled water. The salinities were tested at the beginning of the experiment and at the end. Although the complete records are not shown on the graphs to follow, records were taken of the jars long after anything but the factor of starvation could be considered as potent. The jars were covered with pieces of cheese cloth, bound tightly to their necks by rubber bands. As daily records were taken, a long glass rod was used to rap on the side of the jar or even to poke the larvæ slightly to determine their state of health. Dead larvæ and pupæ were not removed from the jars but living adults were identified and allowed to escape into cyanide jars.

In some of the preliminary and check experiments, as few as 10 larvæ to each jar were used; in the long series and in many of the short ones, either 20 or 25 larvæ were placed in each jar.

In the work of examining the jars and making daily counts, too much credit cannot be given to Mr. F. E. Mehrhof who recorded faithfully every point called for and added much to the success of the experiments by the precision and extent of his records. Although his records were repeatedly checked by the writer, no single error was detected.

The laboratory used for the experiments was a basement room in the building occupied by the various departments of animal and plant biology of Rutgers College. The room was available through the generosity of Dr. Julius Nelson, biologist of the State of New Jersey, to whom many thanks are due for the loan of apparatus and chemicals.

#### EXPERIMENTAL EVIDENCE

In attacking the problem of the effects of salinity on the viability of the various species of mosquito larvæ, it was found desirable to study not only the effects of various concentrations of sea water, but also to study the effects of the pure salts found normally in sea water, including chiefly— $\text{CaCl}_2$ ,  $\text{MgSO}_4$ ,  $\text{KCl}$  and  $\text{NaCl}$ . It was

also deemed wise to run experiments to determine the reason why the water of cedar swamps does not breed either *Culex pipiens* Linn. or the salt-marsh mosquitoes.

### *Effects of Sea Water*

In this experiment jars were prepared containing 200 c. c. each of distilled water and water ranging in salinity from 4 per cent to 12 per cent by steps of 2 per cent. Ten egg boats of *C. pipiens* were placed in each jar and daily records of the number hatched and the number dead were taken.



FIG. 1.—Graph showing larvæ hatched from 60 egg boats of *Culex pipiens* Linn. in 22 hours. Ordinate gives number hatched; abscissa gives salinity of water.

At a salinity of 4 per cent, the maximum number of larvæ (300) were hatched. At the end of 72 hours there were 400 larvæ hatched in the 4 per cent jar but all were dead. With so few egg boats in each jar (10) it is probable that the difference between the number hatched in the jars is of little significance.

When we consider the viability of the larvæ hatched, the salinity is seen to have a direct bearing on the case. Here also the number of first moult larvæ is worthy of statistical examination.

The records of hatched larvæ show that in distilled water only 60 larvæ hatched, but 12 of these were alive at the end of the seventh day; in 4 per cent salinity 400 larvæ hatched, but all were dead on the third day; in 6 per cent salinity 150 larvæ hatched and of these there were 3 alive at the end of the seventh day; in 8 per cent salinity 225 larvæ hatched, and there were 6 alive at the end of the seventh day; in 10 per cent and 12 per cent salinities all the larvæ (over 100) were dead at the end of the first day.

It is evident from these experiments that even if some of the larvae of *C. pipiens* do hatch in salt water, few of them are able to withstand the toxic action of the salt. The writer hopes, however to show by experiments that *C. salinarius* and *C. pipiens* are really the same species, and that in nature when the salinity of the water is

gradually increased by evaporation, even *C. pipiens* may become acclimatized.

In discussing the eggs of mosquitoes, Howard, Dyar and Knab (3) mention the work of certain French investigators in which it was shown that the eggs of *A. calopus* would not hatch in pure sea water but would hatch in a mixture of 30 to 35 per cent sea water with fresh water. The larvæ hatched and developed into imagoes. In a mixture of 40 per cent sea water the larvæ did not develop.

Although the salinity of the sea water is not given, it is not likely that it exceeded 20 per cent. Comparing the investigation with my own experiments, it is evident that the actual salinity of the 40 per cent mixture could not exceed the 10 per cent of my series.

In a short series including jars ranging from control and distilled water to 13 per cent salinity, 10 first-moult larvæ of *C. pipiens* were placed in each jar.

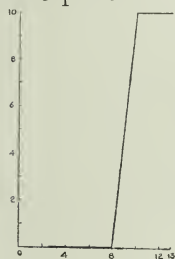


Fig. 2.—Graph showing first-moult larvæ of *C. pipiens* at the end of 16 hours.

The accompanying graph shows the death curve at the end of 16 hours.

The death curve begins at 8 per cent and runs up sharply to 10 per cent where all the larvæ are dead. In the lowest salinity, 4 per cent, and in both distilled water and control jars the larvæ were all alive at the end of 5 days.

In collecting larvæ it was noted that at times the young first-moult larvæ of several salt-marsh species appeared in the same pools. One such collection furnished material for a long series with 25 larvæ in each jar and with 31 jars ranging in salinity from 4 per cent to 40 per cent.

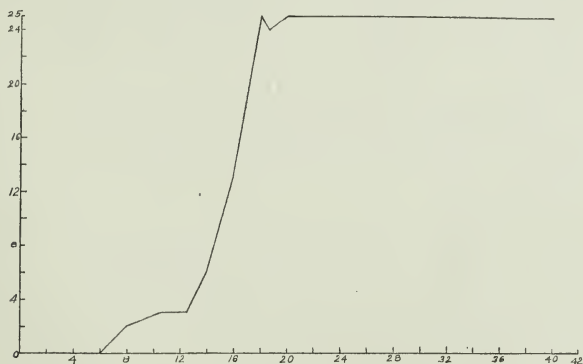


FIG. 3.—Graph showing long series of 25 first-moult larvæ of *A. sollicitans*, *A. cantator* and *A. sylvestris*, after 21 hours.

On the conclusion of the experiment, count was made to determine the number of each species represented in the experiment.

Of the number of larvæ which were identifiable, there were 219 *A. cantator*, 118 *A. sylvestris* and 59 *A. sollicitans*.

Examination of the graph (fig. 3) shows that at the end of 21 hours one larva was still living in the jar containing an 18 1/2 per cent solution of sea water, but in the jar containing an 18 per cent solution and in all others above that percentage, all larvæ were dead. At 16 per cent, 14 of the 25 larvæ were dead. The control showed no deaths at the end of 5 days.

The majority of the work done by the writer on mosquito larvæ was carried on with larvæ of the second moult.

Long and short series were run with second-moult larvæ of the species *A. sollicitans*, *A. cantator*, *A. sylvestris* and *C. pipiens*. For convenience in examination of the graphs, three of the long series including *A. sollicitans*, *A. cantator* and *C. pipiens*, have been grouped in figure 4.

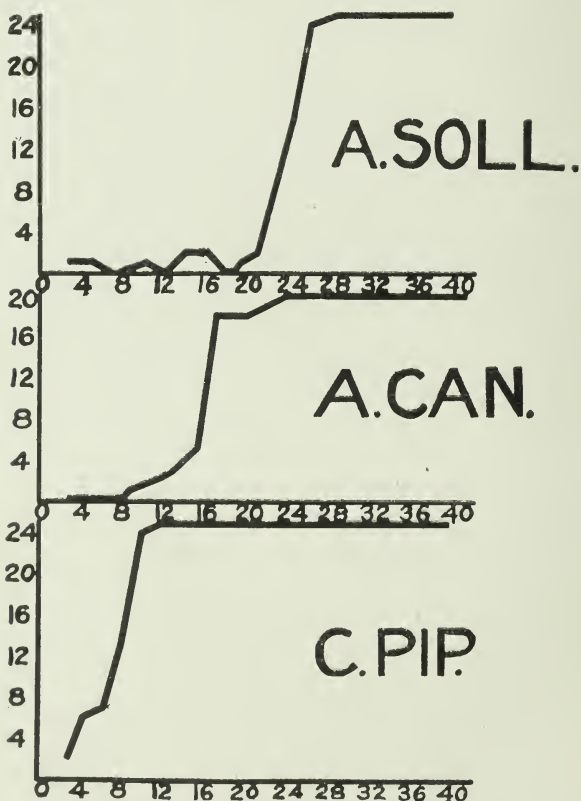


FIG. 4.—Graphs representing long series showing the effects of concentrated sea water on the viability of three species of mosquito larvæ.

*A. sollicitans*

In this graph which shows the larvæ killed at the end of 26 hours, it will be noted that in the low salinities there is considerable mortality, but that the sharp ascent of the death curve begins at about 21 per cent and runs to 28 per cent where all the larvæ are killed. The control and distilled water jars showed no deaths at the end of the period of 26 hours. After two or three days cannibalism becomes notable in experiments in which the food supply is not kept up.

The larvæ of the second moult of *A. sollicitans* were killed by a salinity of 32 per cent in less than 18 hours and by a salinity of 24 per cent in less than 30 hours. At the end of 44 hours in all series run, it was found that *A. sollicitans* larvæ were killed in a salinity of 21 per cent.

While the higher salinities are so toxic for *A. sollicitans*, it must be noted that the larvæ do not develop so rapidly in water of a salinity below 6 per cent. In considering this, we must give due weight to the question of starvation in the experimental jars. It is very certain that the larvæ of *A. sollicitans* are occasionally found in water of a salinity as low as 6 or 7 per cent in company with the larvæ of *A. cantator*.

It has been noted by Graham (1) and others that when common salt is added to jars containing larvæ with a plentiful food supply, in the jars with low salinity the larvæ are retarded in their development, apparently as a result of starvation with the food destroyed, but the development of the full-grown larvæ is apparently hastened by the hypertonic solution.

In this paper it is impracticable to attempt to bring together the evidence of the author on the effects of hypertonic solutions on rate of development in mosquito larvæ. It is hoped, however, that the material already recorded may be supplemented by further work and the whole placed on record at an early date.

*Aedes cantator* Coq.

In the graph under consideration the death curve is shown at the end of 24 hours. The larvæ were all killed in the 24 per cent salinity and above, at the end of the 24 hours, and it will be noted that there were many deaths in the lower salinities. The curve ascends gradually from 8 per cent to 15 per cent, where it rapidly rises to record 18 dead larvæ at 17 per cent salinity.

Found normally in water of a salinity from 4 per cent to 6 per cent lower than that favoring the development of *A. sollicitans*, we would naturally expect to learn that the larvæ of *A. cantator* are more susceptible to the higher concentrations of sea water. In less than 12 hours the majority of the larvæ of the second moult are dead in solutions above 14 per cent, while all are killed at 24 per cent and above even in so short a time.

*Culex pipiens* Linn.

In this graph which shows the deaths at the end of 18 hours

in a long series of larvæ of the second moult of *C. pipiens*, the larvæ are shown to be killed by a very low per cent. The curve begins at about 4 per cent and runs sharply up to 10 per cent, where 24 of the 25 larvæ are dead. Above 10 per cent all the larvæ were killed. In the control and distilled water jars the larvæ survived over a week without food, except that the distilled water jar showed a loss of two larvæ from cannibalistic brethren.

At the end of 41 hours in this series, the death curve runs sharply up from 4 per cent to 8 per cent salinity where all larvæ are dead.

The graph for deaths of *Aedes sylvestris* Theob. will not be presented. This series was a single long series with 25 larvæ in each jar and was not repeated, neither was it checked, as were the others, by several short series. At the end of 47 hours all larvæ of the second moult of *A. sylvestris* were dead in solutions beginning with 8 per cent salinity. The death curve runs rapidly from 4 per cent to 8 per cent salinity.

*Culex salinarius* Coq. which is a salt-marsh mosquito almost identical with *C. pipiens* lives in comparatively fresh water and experiments showed that even the second moult larvæ succumb when placed in water with a salinity of 8 per cent or higher.

Although many records were taken by the writer and others of the optimum salinities for the larvæ of the third moult in nature, but one long series is worthy of record.



FIG. 5.—Graphs representing larvæ of the third moult of the species *A. sollicitans*, *A. cantator* and *A. sylvestris* as effected by the salinity of the water.

At the end of the period of 18 hours indicated in figure 5, the death curve rises rapidly from 8 per cent to 14 per cent, above which all larvæ are dead. At the end of 23 hours, all larvæ were killed in the jars with a per cent of 8 or more of salts.

Many workers on the mosquito problem have recorded the occurrence of larvæ in water of a rather high content of salts. Some few investigators have studied the effects of common salt on the development of the fresh-water forms. Drawing rather largely on

the literature reviewed by Howard, Dyar and Knab (3), we find that certain species of larvæ breed in Algeria in water with 40 gm. of salt to the liter.

The Brazilian investigators (quoting Howard, Dyar and Knab) found that larvæ of *A. calopus* died in one day in water which contained a 30 per cent mixture of sea water. In water consisting of a 20 per cent mixture of sea water with fresh, the larvæ failed to pupate and died after 3 days. The higher salinities prolonged the larval periods in cases where the toxic effect was not so great.

While experiments have been performed to determine the toxicity of salts on mosquito larvæ there is no record of a study which considers the relation of salinity to distribution nor which shows the variable toxicity to be dependent on the species as well as the salinity of the pools from which larvæ were taken. The following table shows the resistance of the mosquito larvæ and the per cent salinities of the source pools.

*Toxicity of Diluted Sea Water*

Sp.	Source	Majority dead in 24 hours.
A. soll.	8-14%	20-26%
A. can.	4-9%	14-16%
A. syl.	3-6%	7-10%
C. sal.	4-6%	9-12%
C. pip.	0-2%	6-10%
Mixture.		
A. soll.	59 }	10-18%
A. can.	219 }	
A. syl.	118 }	
	8%	

Two series of experiments were run with pupæ of *A. sollicitans* and *A. pipiens*, respectively. The results obtained from the use of a long series of 31 jars each indicate that even a 40 per cent solution of sea water is not strong enough to kill a pupa, nor to prevent it from emerging in a normal manner. A few pupæ were killed in some of the jars but the majority developed into adults. Field observations by the writer show that in large shallow salt pools which present a considerable area to the rays of the sun and in which evaporation goes on rapidly, mosquito larvæ may become gradually acclimatized as the salinity increases and may actually thrive in a salinity of over 20 per cent. In connection with these records it is interesting to note similar observations made by the Brazilian investigators and reviewed by Howard, Dyar and Knab (3). The Brazilian workers found that the pupæ of *A. calopus* produced imagoes when placed in pure sea water.

*Toxicity of Pure Salts of Sea Water*

In order to determine the relative toxicities of the salts of sea water, experiments were run first with molecular and  $1/2$  molecular solutions of each salt, then with series ranging from  $1/8$  molecular to molecular. The graphs shown in figure 6 indicate the effects of

five pure salts on *A. sollicitans* and *A. cantator* larvæ of the second moult.

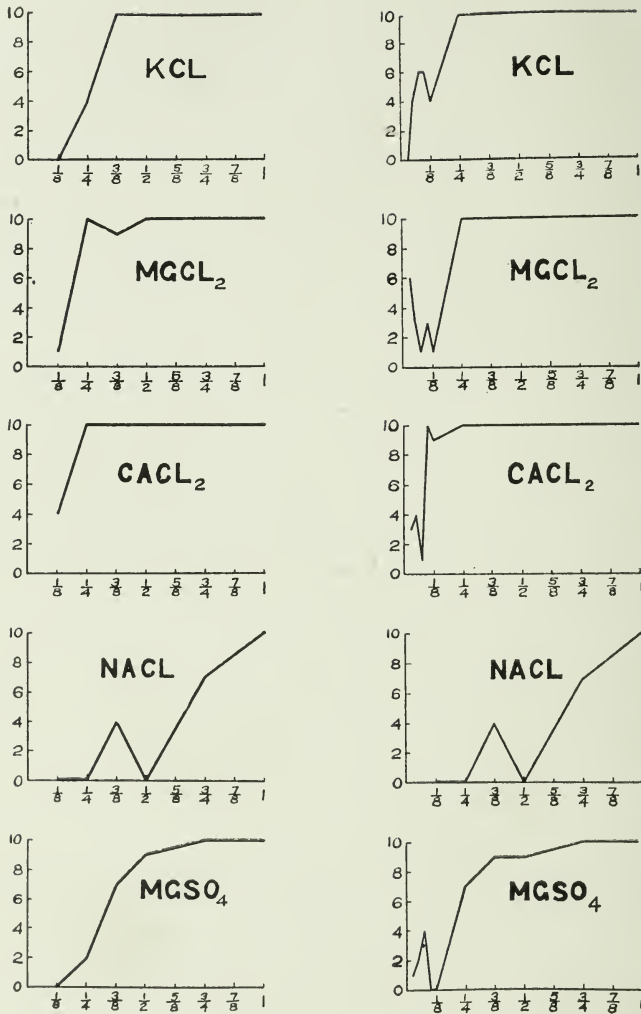


FIG. 6.—Graphs showing the toxic effect of pure salts on mosquito larvæ.

In the graphs shown in figure 6, *A. sollicitans* occupies the left side and *A. cantator* the right side. The period of time which elapsed averages a little over 17 hours.

Examining the record for *A. sollicitans*, we note that  $CaCl_2$  is apparently the most toxic salt, with  $MgCl_2$  next and KCl third. It

is also interesting to note that  $\text{MgSO}_4$  is a little more toxic than  $\text{NaCl}$ .

In the case of *A. cantator*,  $\text{CaCl}_2$  is the most toxic.  $\text{KCl}$  and  $\text{MgCl}_2$  are almost the same in action and  $\text{MgSO}_4$  again surpasses  $\text{NaCl}$  in toxicity.

But if we reexamine the figures, taking the molecular weights and considering the actual grams per liter of each salt, we find that for *A. sollicitans*,  $\text{KCl}$  is the most toxic salt, with  $\text{MgCl}_2$  and  $\text{CaCl}_2$  nearly the same in toxicity. In the case of *A. cantator*  $\text{KCl}$  again leads, but  $\text{CaCl}_2$  is second and  $\text{MgCl}_2$  is third. Table I shows the relative amounts of the salts required to kill and the species differences are thus indicated.

TABLE I  
Toxicity of Pure Salts

Sp.	Salt	Strength	No.	Age	Time
<i>A. sollicitans</i>	$\text{KCl}$	27.975 gm. per l.	10	2 mlt.	17 hr.
"	$\text{MgCl}_2$	50.085 gm. per l.	10	2 mlt.	17 hr.
"	$\text{CaCl}_2$	54.75 gm. per l.	10	2 mlt.	17 hr.
"	$\text{NaCl}$	58.54 gm. per l.	10	2 mlt.	17 hr.
"	$\text{MgSO}_4$	92.475 gm. per l.	10	2 mlt.	17 hr.
<i>A. cantator</i>	$\text{KCl}$	18.65 gm. per l.	10	2 mlt.	17 hr.
"	$\text{CaCl}_2$	21.9 gm. per l.	10	2 mlt.	17 hr.
"	$\text{MgCl}_2$	50.085 gm. per l.	10	2 mlt.	17 hr.
"	$\text{NaCl}$	58.54 gm. per l.	10	2 mlt.	17 hr.
"	$\text{MgSO}_4$	92.475 gm. per l.	10	2 mlt.	17 hr.

While the writer is fully aware that these experiments are too incomplete to warrant generalization, it is entirely possible that the larvæ of *A. cantator* and *A. sollicitans* do normally live in media which differ with respect to content of some of the salts of sea water. It is very certain that they live in water of salinities which are different, *A. sollicitans* occupying water of a higher salinity than *A. cantator*. If we are to believe Joseph and Meltzer (4), we must conclude that the reason  $\text{CaCl}_2$  is more toxic for *A. cantator* than it is for *A. sollicitans* is that normally the environment of *A. cantator* does not furnish it with as much  $\text{CaCl}_2$  as the other species under consideration. Joseph and Meltzer (4) state their law as follows—"The toxicity of magnesium, calcium, potassium and sodium to the entire animal is in inverse proportion to the amounts in which they are present in the serum of that animal. The smaller the amount of the ion in the serum, the more toxic it is in the infusion." The writer anticipates rather extensive series of experiments with the larvæ of the New Jersey mosquito to test toxicities of the inorganic salts further.

It would be strange if in the course of the extensive studies carried on all over the world in connection with the problem of mosquito extermination, some work had not been done on the effect of salts on development. Let us examine a few of the more important contributions.

A number of years ago a successful attempt was made to take advantage of the fact that the house mosquito and the malarial mosquito are both fresh-water species. The experiment is described by Howard (2) in his little book "Mosquitoes" published in New York in 1911. At Virginia Beach, near Norfolk, Va., was a large fresh-water lake, which "with its adjoining swamp, was a source of mosquito supply, and it was feared (although this was before the mosquito dissemination of malaria was proven) that it made the neighborhood malarious." The result of cutting canals which connected the lake with the salt water, was the change of the waters to salt instead of fresh water and the complete disappearance of mosquitoes.

In discussing the control of domestic mosquitoes, Howard, Dyar and Knab (3) cite an attempt made in 1905 in New Orleans to destroy mosquito larvæ in the open gutters by the use of common salt.

The work gave fine results where properly done, but the influx of numerous adults of *A. sollicitans* from the salt marshes near by caused the citizens to protest against the salting, claiming that the sanitary officials were bringing about suitable breeding conditions for *sollicitans*.

In considering the means of control of the mosquitoes, Dr. W. M. Graham (1) pointed out that the destruction of the mosquito may be effected by methods which destroy the larvæ or by methods which destroy the food of the larvæ. Doctor Graham made experiments which showed that the larvæ of *Pyretophorus costalis*, breeding in water rendered partially opaque by suspended matter and containing motile algæ, will become cannibalistic if the suspended matter is precipitated by the addition of 3 per cent common salt. He also pointed out that the growth of very young larvæ is inhibited by concentrations less than 3 per cent, while fully grown larvæ are apparently accelerated in their development by hypertonic solutions.

In order to determine to what extent the action of salt on mosquito larvæ is due to the hypertonicity of the solution, and to what extent to the destruction of the food supply was the problem which engaged the attention of Doctor J. W. Scott MacFie (5).

Larvæ of *Aedes calopus* (*Stegomyia fasciata*) were used in the experiments. They were found to occur in water of salinities ranging from 0.005 per cent NaCl to 0.019 per cent NaCl, the average of six determinations being 0.012 per cent NaCl. In the first experiment 10 mature larvæ were placed in each of 6 jars containing, respectively, 0.5 per cent, 1 per cent, 2 per cent, 3 per cent, 4 per cent and 5 per cent NaCl solutions in clear water. Thus the factor of precipitation was excluded. In 5 per cent NaCl all larvæ died within 2 hours, in 4 per cent all had died within 3 days; in 1 per cent during the ten days through which the experiment was continued, 4 larvæ died, 4 pupated and hatched, and 1 remained alive at the conclusion of the experiments.

In the second experiment more dilute solutions of salt were used. The salinity of the natural medium was increased by adding salt,

and jars were prepared containing 0.10 per cent, 0.15 per cent, 0.20 per cent, 0.25 per cent and 0.30 per cent. Larvæ were also placed in a solution of 0.32 per cent NaCl in pure water. At the end of 9 days all larvæ had died, pupated or hatched. The author concludes that the very young larvæ are more adaptable to change in concentration of their medium.

In the 0.30 per cent solution 11 out of 20 of the larvæ died as larvæ, while in the 0.10 per cent solution none of the larvæ died as larvæ. By way of criticism it might be stated that the writer has found that after the first day in such solutions starvation may induce cannibalistic activities, and thus vitiate the results.

We may close discussion of the literature by brief mention of the work of the Brazilian investigators reviewed by Howard, Dyar and Knab (3). The Brazilian workers tried numerous experiments with mixtures of sea water which indicated that the larvæ of *A. calopus* will develop in water containing 40 per cent sea water. They experimented with NaCl and discovered that larvæ would not withstand solutions stronger than 1 per cent.

### CONCLUSIONS

Since field records and laboratory experiments closely agree we may conclude that the distribution of the two dominant species of salt-marsh mosquitoes in the State of New Jersey is in part dependent on the salinity of the water. The fresher waters seem to bring out the brown salt-marsh mosquito, *A. cantator*, while the marsh pools with slightly higher salinity seem to be most favorable for the development of *A. sollicitans*.

As a means of control of the salt-marsh mosquitoes, aside from its value in bringing fish to the pools, the plan of ditching is bound to be of the utmost importance. It provides a means of quickly draining some areas, and brings the salt water to increase the salinity of permanent pools, rendering them salt enough in some cases to retard and in some cases completely to check the development of the mosquitoes. Another reason for the action of the water aside from its salinity seems quite plausible to the writer. This is the possibility that the incoming tide may drown the mosquito larvæ by the rise and fall of its waves as they advance. It seems to the writer that this may be the "line of battle" which is even more effective at high tide than the fish or the effect of salinity.

We may conclude in any case that the greatest factor in the appearance of *A. cantator* at an early date in the season and its predominance over certain upland regions of the State of New Jersey is dependent on the low salinity of the water: while the appearance of *A. sollicitans* at a later date and its existence on the comparatively low marshes, is dependent on its apparent need for a relatively high degree of salinity to favor its development. In the case of any of the species of salt-marsh mosquitoes, it is quite possible to kill the very young larvæ by the use of water of the salinity of the sea.

The possibility of thus eliminating many of the mosquitoes which breed in marshy land appears to be great and the steps already taken in this state are shown to be the best.

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466 Ag. Mem

A BIOLOGICAL STUDY OF THE MORE IMPORTANT OF THE FISH  
ENEMIES OF THE SALT-MARSH MOSQUITOES

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NEW JERSEY

AGRICULTURAL

**Experiment Stations**

BULLETIN 300

NEW BRUNSWICK, N. J.

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# NEW JERSEY

## AGRICULTURAL EXPERIMENT STATIONS

### BULLETIN 300

JUNE 1, 1916

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#### A BIOLOGICAL STUDY OF THE MORE IMPORTANT OF THE FISH ENEMIES OF THE SALT-MARSH MOSQUITOES <sup>1</sup>

by

F. E. Chidester, Ph. D.

#### INTRODUCTION

The mosquito has a long list of natural enemies and if the exact standing of each were well understood it is possible that some of the more important might be artificially encouraged to a point where their warfare on the mosquito would prove the most efficient factor in its satisfactory control. With this in mind the writer was invited to examine the possibilities of certain fishes already known as mosquito destroyers. The study was begun September 19, 1914 and continued for a little over one year.

The study consisted of making collections of fishes throughout the year with records of tides, salinity, specific gravity and temperature of the waters in which they were taken; a study of the stomachs of samples from the collections; experiments on the resistance of the fishes to high concentrations of salts; experiments on the effect of highly concentrated sea water on the development of the embryos; and many feeding experiments, using mosquito larvæ, *Dytiscus*, daphnids and other known food of the killifishes. These experiments were supplemented by other experiments on the importance of the water tiger (*Dytiscus*) and the tadpoles of several species of frogs as mosquito larvæ exterminators. The last named group of experiments will be elsewhere discussed.

#### ENEMIES OF THE MOSQUITO

In outlining the problem, it was found desirable to prepare a list of the animals recognized as foes of the mosquitoes, and with

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<sup>1</sup> Contributions from the entomological laboratory; Thomas J. Headlee, Ph. D., Entomologist.

the idea that it may be used in later studies of this sort, it is presented with this paper. The list is compiled from many sources, but chiefly from the papers of Smith (13), Howard, Dyar and Knab (3) and Headlee (2).

### Invertebrates

Protozoa—*Spirochaeta culicis*, *Diplocystis*, *Nosema stegomyiae*, *Crithidia fasciculata*, *Herpetomonas algeriense*, *Trypanosoma culicis*.

Coelenterata—*Hydra fusca*, *Hydra viridis*.

Platyhelminths—*Agamodistomum martiranoi*.

Nemathelminths—*Agamomermis culicis*.

Arthropoda—*Hydrophilus obtusatus*, *Dytiscus marginalis*, *Acilius sulcatus*, *Nepa*, *Notonecta*, *Ranatra fusca*, *Aeschna*, *Erythemis simplicicollis*, *Psorophora ciliata*, *Megarhinus septentrionalis*, *Lutzia bigotii*, *Lesticocampa*, *Corethra*, *Tanytus dyari*, *Lispa sinensis*, *Horpopeza obliterate*, *Tahydromia macula*, *Cordilura haemorrhoidalis*, *Monedula signata*, *Emesa longipes*, *Salticus*, *Crangon vulgaris*.

### Vertebrates

Pisces—*Fundulus heteroclitus*, *F. majalis*, *F. diaphanus*, *Gambusia affinis*, *Cyprinodon variegatus*, *C. calaritanus*, *Heterandria Abramis chrysolencas*, *Carassius auratus*, *Eupomotis gibbosus*, *Mollinesia latipennis*, *Girardinus poecilioides*, *G. caudimaculatus*, *Haptochilus*, *Lucius am.*

Amphibia—*Rana pipiens*, *Rana palustris*, *Discoglossus pictus*, *Triton cristatus*, *T. alpestris*, *Diemyctylus tortosus*, *Amblystoma opacum*.

Reptilia—*Ptychozoon homalecephalum*.

Aves—*Chordeiles virginianus*, *Choctura pelagica*, *Petrochelidon lunifrons*, *Iridoprocne bicolor*, *Hirundo erythrogastra*, *Progne subis*, *Riparis riparia*, *Tachycineta thalassina lepida*, *Myiochanes virens*, *Sayornis phoebe*, *Tyrannus tyrannus*, *Anas platyrhynchos*, *Aegialitis semipalmata*, *Pisobia pusillus*.

Mammalia—*Eptesicus fuscus*, *Homo sapiens*.

### FISHES KNOWN TO EAT SALT-MARSH MOSQUITOS

No writer on the subject of the relation of fishes to the mosquito problem can pass lightly over the magnificent work done by Mr. William P. Seal (10) of Delair, New Jersey, who for years has been known as an authority on the subject. Independently and later as fish expert to Dr. J. B. Smith, Mr. Seal showed the importance of utilizing the fish as one of the most important groups preying on the mosquitoes. In Dr. Smith's report (13) and in later papers Mr. Seal (10, 11) has pointed out clearly that on the salt marshes, *Fundulus heteroclitus*, *Fundulus diaphanus*, *Cyprinodon variegatus*

and *Gambusia affinis* are all extremely important enemies of the mosquito larvæ.

As the writer was concerned primarily with the salt-marsh mosquito, his problem was to discover what species of fish was most effective on the marshes, both ditched and unditched. While the work herewith recorded is largely from Middlesex and Monmouth Counties, the excellent report system of the Entomologist and the willing cooperation of the many chief inspectors and inspectors extend the records throughout the entire State.

In the following pages we shall show that not only is *Fundulus heteroclitus* the most voracious enemy of the larvæ, pupæ and adults of the mosquito, but that on account of the migration habits, numbers and supremacy of the species, it is the most important natural factor in the extermination of the salt-marsh mosquito. It is worthy of note that *Fundulus heteroclitus* is also an important enemy of the green-headed fly:

#### POOLS AND STREAMS UNDER OBSERVATION

In order to study the fish closely and extend the period of observation under natural salt-marsh conditions, a marsh near Bonhamtown, New Jersey, and about three miles from the City of New Brunswick, was selected as the chief station for study. Here collections were made at intervals from September 19, 1914 to August 15, 1915.

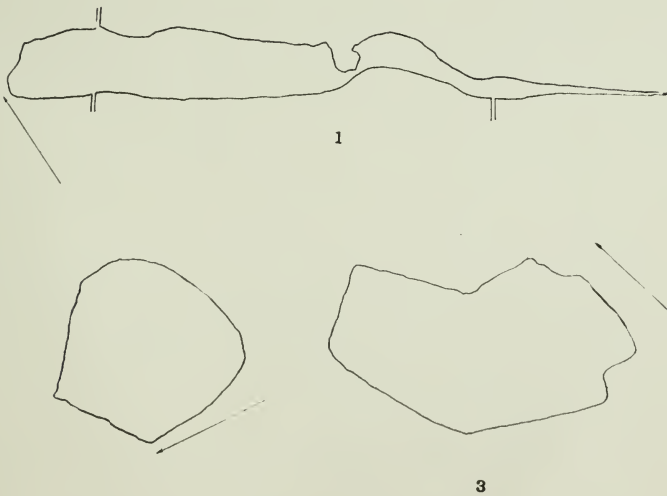


Fig. 1.—Diagram of salt-marsh area showing pools from which fish were taken. Scale: 1 inch = 12 feet.

During three weeks of June, 1915, many experiments and observations were made at the Marine Biological Station, Woods Hole, Massachusetts. Some of the problems attacked were the effect of high concentration of salts on the viability of *Fundulus*; the effect of highly concentrated sea water on the development of the embryo of *Fundulus heteroclitus*; the water tiger as food for *Fundulus heteroclitus*; adaptation of *Fundulus diaphanus* to salt water; acclimization of the tadpole to salt water; habits of the migrating *Fundulus*; and effect of varying the flow of water on the activity of *Fundulus heteroclitus*. The problems named will be further discussed in later papers, but the most important facts germane to the present discussion will be incorporated in the pages following in appropriate places.

It is a pleasure to acknowledge the kindness of Dr. F. R. Lillie, Dr. Gilman A. Drew and Mr. George Gray of the Marine Biological Laboratory in placing at my disposal the laboratories and supplies of their institution. The excellent library was of great help, also.

At the suggestion of Dr. T. J. Headlee, a trip was made to Atlantic County early in July to investigate the conditions in virgin territory undrained by human agents. Marsh land near Beach Haven, Tuckerton, and Atlantic City was studied and the dispersal of fishes noted. The Tuckerton Creek and many creeks near it also were studied.

At the Bonhamtown meadows work was intensified on three permanent pools, additional studies being made of conditions in many other small and large pools and on the activity of the fishes in the ditches and along the shores.

These pools were surveyed by Mr. R. B. Hiller, an engineering student of Rutgers College, and were sounded at intervals. Collections were made from the pools and from ditches and larger pools by means of a 20-foot minnow seine and several small dip-nets.

Table of collections with species of fish identified

Number of *Fundulus* het.    *Cyprinodon* var.    *Apeltes*    *Anguilla*.  
collections

29	1581	105	19	22
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Although *Fundulus majalis* did not appear on the Bonhamtown marshes, the species is fairly well distributed along the New Jersey coast, running in and out with the tides, confining itself to the salt and brackish water and not migrating into the shallows. Because of this habit, it cannot enter largely into the extermination of the salt-marsh mosquito.

Besides the fish named, *Lucania* and *Menidia* were collected at times when the tides were especially high. Among the *Arthropoda* collected from the pools under observation were *Dytiscus* and its larvæ the water tiger, *Crangon vulgaris* and *Palaemonetes* (shrimps) and *Nolonecta*. Many small unidentified myriapods were dug up

with the fish when collections were made in midwinter from the mud in the bottoms of the pools.

### MIGRATION IN FISHES

Like its relative, *Fundulus majalis*, *Fundulus heteroclitus* is most normal in activity in moving water. *Fundulus majalis*, which moves in and out with the tides, has been studied by Dr. S. O. Mast, who finds that it is not only prone to move with the tides, but that when the outlet to the ocean is plugged, the fish will convey themselves overland by flopping in the general direction of the ocean. Mast (5) shows that the fish actually keep their sense of direction in the overland course. He concludes that the fish "apparently remember" the location of the outlet. As Mast can find no external features which seem capable of guiding, he concludes that the behavior is dependent on internal factors.

*Fundulus heteroclitus* migrates to the shallowest pools of the salt marshes and travels up streams past the salt water to water of a very low salinity. When it is land-locked it stays throughout the winter in the mud in the bottom of salt marsh pools. It is significant that *Fundulus heteroclitus* will return to the ocean on the tides in the late fall, and that it ceases coming to the marshes when the water reaches a temperature of about 45°F.

Records made with the salinometer and thermometer from November, 1914, to August, 1915, show that *Fundulus heteroclitus* react negatively to water of a low salinity when the temperature is below 45°F. As the temperature rises and the marsh pools and streams are increased in salinity by the incoming high tides of spring, the fish migrate freely and stay in water which is fresher than they will tolerate at colder temperatures.

Permanent unditched pools contained killifishes (*F. heteroclitus* and *F. diaphanus*), eels, sheeps-head minnows (*Cyprinodon*) and shrimps, throughout the entire winter. Field records of the three permanent and four temporary pools observed, showed that during November, the fishes attempted to burrow in the bottoms as the temperature stood between 43°F. and 47°F. In the case of the permanent pools whose bottoms are covered with soft mud and finely torn eel grass and sedge, the fish burrowed down to a depth of 6 or 8 inches and many remained there in the black oozy mud at a temperature ranging from 40°F. to as high as 45°F. On sunny days some of the fishes came out and swam around, plainly visible under the ice which was sometimes one-fourth to one-half inch thick over the salt pools.

In the temporary pools where the bottoms are composed of matted and hardened grass bound together with clay, the fish rapidly succumb at the onset of cold weather. Specimens with whitened fin-edges secured early enough in the morning to be certain that the sun's rays had not materially changed the temperature of their pools were

found to be feebly endeavoring to burrow into the mud. The water in the pools from which these dying fish were taken registered 43°F. and 44°F. Some of the dying fish revived when brought to the laboratory and were kept for several weeks before being preserved.

While temperature apparently explains the migration inland and the subsequent return to the salt water, it is interesting to note that during a period of two or three weeks in August, during the past summer, the fish did not migrate to the shallows. This condition may not be in evidence every year, but some data indicate that it is the usual thing. Records taken by Mr. F. E. Mehrhof at Bonhamton in late July and early August showed that the killifish were very scarce at that time. Mr. Russel Gies, chief inspector of the Union County Mosquito Extermination Commission reported that during the period between August 4 and August 10, the fish did not run into the ditches and could not be attracted into them by meat baits. While the meat bait probably caused acids of decay which would drive the fishes away, the fact that there was no migration for at least a week seems important. Records from other inspectors throughout the State showed that there is apparently a period of about two weeks in August marked by almost complete absence of the actively feeding killifishes from the marshes.

Among the explanations which occur to me the following important ones will be further discussed elsewhere. First, the temperature of the water may be sufficiently high to reverse the reaction of the fish to fresh water and cause it to return to salt; second, the exhaustion subsequent to spawning may cause the fish to hesitate about wandering with the tides; third, appetite may be satisfied in the case of a large body of fish which have been living in brackish water and which begin to return to the salt, to be replaced by others which have not been far inland. These points will be taken up in detail on page 10.

Some of the finest experimental work on fishes has been done by Dr. Victor E. Shelford (12) of the University of Illinois and his students, Dr. W. C. Allee and Dr. M. M. Wells. Much of the discussion on migration to follow is based on their findings.

Shelford and Powers have shown (12) that herring are sensitive to temperature differences as small as 0.2°C.

Johnstone (4) has shown that the migration of herring in Europe is closely associated with the salinity and temperature of the sea.

Shelford and Powers (12) have shown that alkalinity and acidity are more important than salinity. The herring and salmon experimented with reacted to small fractions of a cubic centimeter per liter of  $H_2S$  and became negative to sea water which was slightly more acid than the fresh.

Wells (16, 17, 18, 19) takes issue with Marsh who claims that "water which will support life must be slightly alkaline." Wells claims (18, 19) that the water which seemed slightly alkaline when

methyl orange was used as an indicator, was probably acid to phenolphthalein.

Wells shows that fresh-water fishes recognize and react to the presence of salts in solution, the reaction being such as will bring them into their optimum salt concentration. From his own and from Shelford's work on the salt-water fishes, Wells concludes that fresh water and probably salt water fishes are not so sensitive to salt ions as they are to hydrogen and hydroxyl ions. He also shows that starvation causes some fishes to select higher concentrations of salts than those normally selected, while the reverse is true of other species of fish.

Roule (9) believes that salmon migrate to a richer supply of oxygen.

#### LIFE HISTORY OF *FUNDULUS HETEROCLITUS*

*Fundulus heteroclitus* is "the killifish of Schopff, the yellow-bellied and the white bellied killifish of Mitchill and the big killifish and barred killifish of De Kay. The Indian name 'mummichog' is applied to this as well as other species and some persons call it the salt water minnow. It is also called the mud-fish, cobbler and pike minnow." [Bean (1) ].

The killifishes are characterized by banded markings, rounded fins, a very convex tail fin, short head, obtuse snout, space between the eyes very flat, lower jaw projecting, and a length of not more than 6 or 7 inches.

The male reaches a length of about 5 inches and is easily distinguished at all ages and in all seasons by the presence of a number of transversely arranged silver bars on the sides and a yellow or orange colored belly. The ground work of the body is dark green, and in mature specimens at the breeding season there are numerous white and pale yellow spots of color on the sides. The dorsal fin of the male bears a dark spot at the base of the last rays; in the young male this dark spot is subdivided into two blotches. The *vas deferens* extends to the anal fin or even a little way along the anterior ray.

The young female has dark bands like the silver bands of the male, and during the spawning season some older females show the dark bands against their olive ground color. The majority of the older females, however, rarely show the transverse bands. The oviduct extends along the anterior ray of the anal fin about two-thirds its distance.

It is interesting to note that the killifishes have the power of changing their color rapidly to agree with their background. This serves them well in escaping the notice of some of their enemies, as well as enabling them more readily to approach their living food.

In New Jersey in the vicinity of New Brunswick, the spring migration begins as early as the latter part of March and gravid females were found as early as April 19, 1915. The spawning season

for older fish reaches its height during the latter part of May in this latitude. After spawning, the fish do not seem active for a time and as previously indicated, we find that migration far inland ceases almost entirely in New Jersey during about two weeks in August.

When we consider that there are at least three kinds of fish of the same species coming in with the tides toward the fresher waters, it is easy to explain on theoretical grounds, at least, such a condition as has been mentioned.

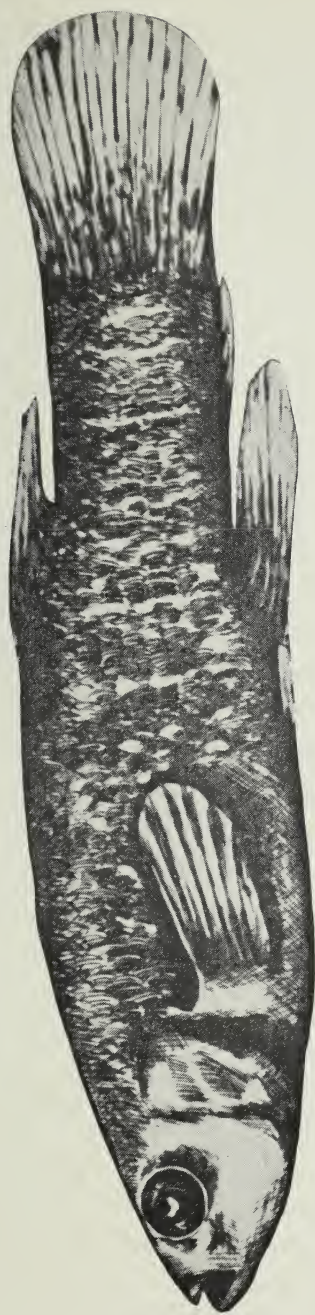
In the very early spring we have the larger males and females which will spawn in a week or two; a large number of medium-sized fish which come in to feed but which will not spawn for a month at least; and lastly, the yearlings, which will not spawn until late in August or, if of the late brood of the previous year, probably not until the next summer. Knowing that after each fish is completely spent of its genital products there must be a period of comparative sluggishness, we find that the absence of the larger fishes from the marshes in August is readily explained; this also explains the relatively few medium-sized fish on the marshes in August. The fact that even the smaller fish do not appear in any great numbers in the middle of August, leads one to believe that another factor enters into the matter.

This factor, the writer believes, is that of warmth. The fish which reacted positively to the fresher water as the temperature increased inland in the spring, may have reacted to the lower salinities on the marshes more readily when in a state of starvation. In the middle of August there are three conditions which might influence the return: first, the higher temperature which might reverse the reaction to fresher water; second, the condition of sluggishness following spawning and inhibiting any battle with tides; and last, the fact that the animals are well fed and hence in a condition to return to their abode for the winter.

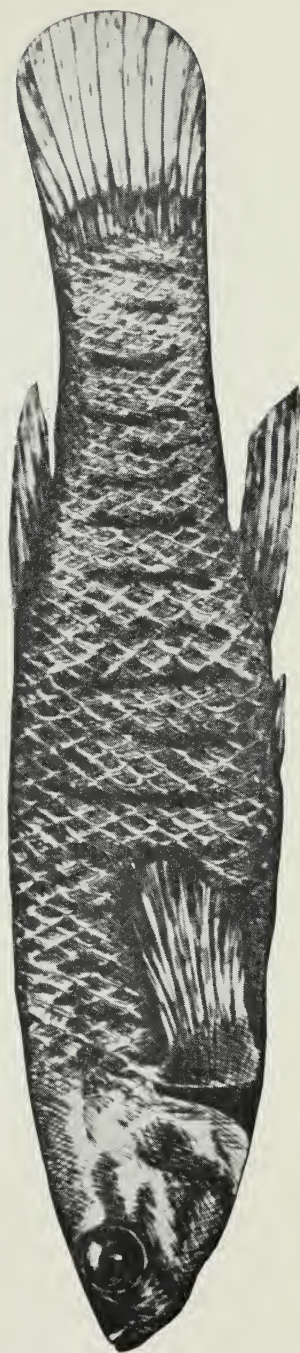
Early in September large numbers of *Fundulus heteroclitus* return to the marshes with the tides, and they continue to run in and out, staying for shorter and shorter periods as the cold increases in the fresher streams, until finally they cease running until the following spring.

The mating habits of *Fundulus heteroclitus* have been very well described by H. H. Newman (6) in the Biological Bulletin for 1907.

The presence of males and females in aquaria together is known to be sufficient to cause the females to spawn. If a male is not present, when a gravid female is too much distended with eggs she will assume a peculiar S shape, and vibrating her tail, will extrude some of her eggs. If a male is present, he will usually seek out and corner a female about ready to spawn and lock his dorsal and anal fins against hers. Then follows the simultaneous extrusion of eggs and sperm.



1



2

Plate I. Fig. 1.—*Fundulus heteroclitus* male.

Fig. 2.—*Fundulus heteroclitus* female.



In nature, although many of the eggs are eaten by other fish and even by the mother, the majority of them sink to the bottom in mud and are there protected. The development of the eggs of *Fundulus* depends on the temperature of the water, but is about three weeks in length.

During development, the hardy eggs of *Fundulus heteroclitus* may be subjected to almost unbelievable maltreatments and still develop. They will develop in water ranging from distilled to even as high as 40 per cent <sup>1</sup> salt. Placed in solutions of alcohol, ether, chloretone and magnesium chloride in sea water, many develop abnormally, but develop to hatching. [Stockard (14, 15)].

The young fish hatches with a yolk sac which rapidly disappears, leaving it to feed on minute plankton. By the following spring after hatching a young *Fundulus* is ready to eat much the same foods as the largest of its kind.

The worst enemy of the killifish is probably his own kind. Many eggs are eaten by the adults of the same species. Among the fish known to eat *Fundulus heteroclitus* are the striped bass, weakfish, smelt, blue fish and dogfish. Sea birds and even domestic ducks are also known to be enemies of the little killifish. [Bean (1)].

Man takes advantage of the fact that killifishes are easily obtainable and uses quantities of them as bait for other larger fish.

#### FOOD OF THE KILLIFISHES

The very young *Fundulus* of a little less than a year can eat as many as six pupæ of the mosquito in half an hour and survive the meal. In an experiment performed purely as an extra, I placed a very small *Fundulus* (1cm.) in a jar with six pupæ of *Aedes sollicitans* Wlk. which were at least half its length. In 30 minutes all the pupæ were eaten. The first one seized was eaten in about 6 minutes.

Examinations of the stomachs of adult *Funduli* showed that they eat larvæ, pupæ, and adults of all the salt-marsh mosquitoes. They also eat *Dytiscus*, *Notonecta* and many Daphnids. In the winter small quantities of algal matter and a few small shrimps constitute the most of the food of the active individuals. In the early fall, the chief food besides mosquitoes seems to be insect and snail eggs and occasionally a few fish eggs.

Mr. T. C. Nelson of the University of Wisconsin, informs me

<sup>1</sup>From unpublished experiments by the author.

that he has seen *Fundulus heteroclitus* jump out of the water to catch mosquitoes, green-head flies and Ephydra.

#### EFFICIENCY OF *FUNDULUS HETEROCLITUS* AS A MOSQUITO EXTERMINATOR

In the laboratory many experiments were performed with *Funduli* of all ages to determine how many mosquito larvæ they will take at one meal. Out of about 30 experiments, the average number was 25. After eating from 20 to 30 larvæ, a *Fundulus* apparently needs time to digest, as it rarely begins eating again for at least two hours.

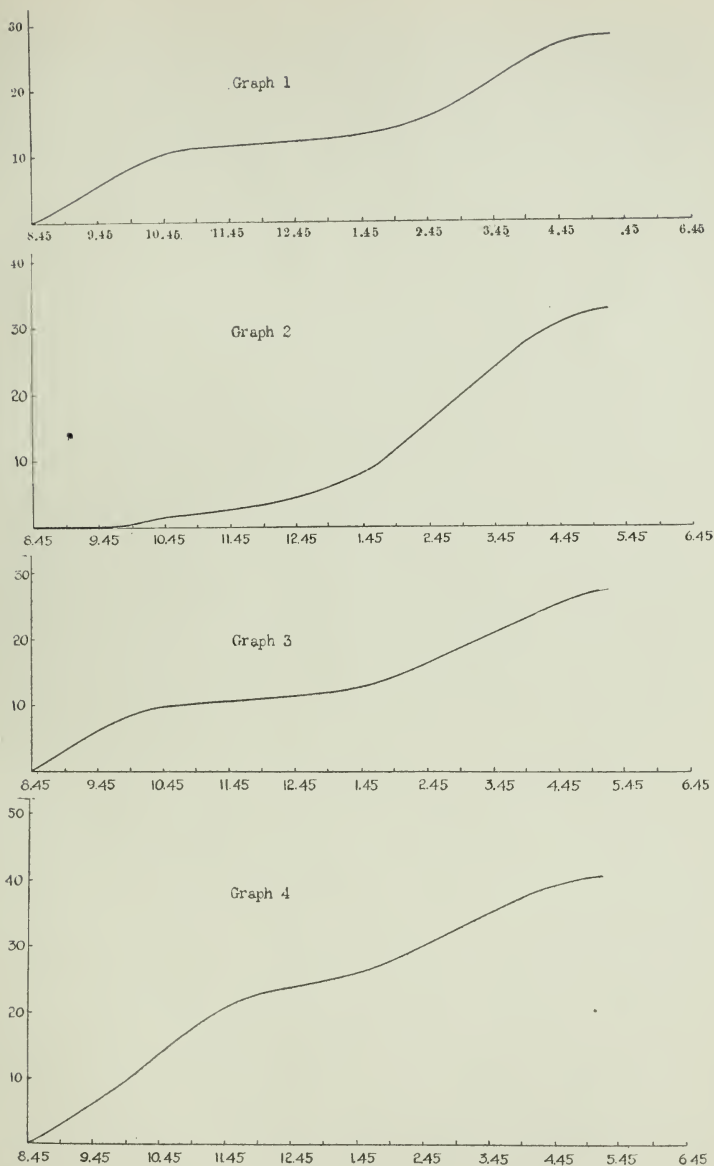
The best record of feeding for a medium-sized *Fundulus* was 15 mosquito larvæ of the second moult in 5 minutes.

In order to determine the capacity of killifishes under laboratory conditions, when fed 10 larvæ at a time during a period of about 8 hours of the day, experiments were performed as follows.

Two large killifishes (about 7 cm, or 2.75 inches) two medium-sized killifishes, (about 5 cm, or 2 inches) and two small killifishes (about 3 cm, or 1.20 inches) were selected as suitable for the experiments. All were apparently in perfect health and among the most vigorous of the lot collected at this time. Six aquarium jars, each 12 inches in diameter and 4 inches in height were prepared with salt water previously boiled and diluted to 6 per cent salt. Into each of the jars a fish was placed and allowed to accustom itself to its surroundings for a period of about 12 hours. A mixture of mosquito larvæ of the species *Aedes sollicitans* Wlk., *Aedes cantator* Coq. and *Culex salinarius* was carefully sorted into larvæ of approximately the same age and size, and held in readiness for the feeding experiment.

Beginning on the fourth of August, 1915, Mr. F. E. Mehrhof began feeding the larvæ to the fish, continuing his experiment for a period of four days. The plan of the experiment was to observe the fish at intervals of 30 minutes and supply them with larvæ of the second moult in groups of 10. When more than one larva was left in the jar the fish was not given a new lot of 10. The presence of larvæ which had passed through the body of the fish as excrement was ignored.

The graphs which follow show the average consumption of each fish for the period of four days.



*Fig. 2—Diagram showing feed curves for four days:*

*Graph 1—Fish No. 1.*

*Graph 2—Fish No. 2.*

*Graph 3—Fish No. 3.*

*Graph 4—Fish No. 4.*

In discussing the results obtained we must first point out some of the most apparent errors in the experiment. The experiment was performed during the hours 8 a. m. to 5 p. m. and therefore the night life of the fish is not recorded. It is probable that many more larvæ would have been eaten had they been given to the fish very early in the morning. Others would have been eaten as late as 7:00 p. m. and probably some would have been eaten in the darkness of the night. Again since the killifish depends almost entirely on its visual sense in locating the mosquito larvæ and since the specimens used could get no new lot of 10 larvæ until all but one larva, dead or alive, was eaten, many minutes of idleness and probably hunger were passed over. Lastly, the food was entirely of mosquito larvæ.

Briefly summarizing the results of the experiments we may say: that first, the highest record of daylight consumption for the period of four days was 123 larvæ; other fish ate more but did not survive; second, the highest record of daylight consumption of larvæ for three of the four days was 135, and then the fish *died*; third, the total number of larvæ consumed during four days and three nights by four of the fish which survived was 600; the total number consumed by these same fish for the daylight hours only was 451; fourth, the greatest number of larvæ eaten in one day was 70, but two of the fish made this record and one of them ate but 20 larvæ the following day and then died; fifth, the two largest fish were the only ones which survived the whole period of four days and seemed ready for more food at the end of the experiment. The average consumption of the two survivors per day for the period of four days was 35 larvæ per day each. The average daylight consumption for that time was 27.25 larvæ each.

It is obvious that experiments performed on such a small number of fish for such a short period of time prove little. They do show, however, that the capacity of medium-sized killifishes of the species *Fundulus heteroclitus* is enough to make it a formidable enemy of the mosquito larvæ.

It is interesting to note that *Fundulus heteroclitus* not only will eat larvæ, pupæ, and the shells of the same, but that it will eat these over and over again, when hard pressed by hunger.

In order to test the activity of *Fundulus heteroclitus* as an enemy of the water tiger, larva of *Dytiscus*. I performed numerous experiments at Woods Hole, Mass., using medium-sized killifish and rather large water tigers. In the presence of mosquito larvæ the water tigers were not eaten, but after the mosquito larvæ had been captured the water tigers were soon devoured.

As Dr. G. H. Parker (7, 8) has shown the importance of the visual sense as well as the olfactory sense in the teleosts, particularly *Fundulus heteroclitus*, experiments on the attractiveness of larval shells to *Fundulus* were hardly necessary. It seemed wise, however, to make a few such experiments.

Four medium-sized male *Funduli* were placed in a jar containing larval shells and a few mosquito larvæ. The larvæ were seized instantly, but not all of them had been captured before the voracious killifishes seized and partly devoured larval and pupal shells. The larval shells were spit out rather forcibly on being about half swallowed. The spitting reaction was not limited to larval and pupal shells, however. In many of my experiments with killifish placed in jars with large numbers of mosquito larvæ, a sated individual would act like the small boy at Thanksgiving, and seize larvæ which it could not stomach. After a few such "tries" the fish sometimes rest and meditate on the bottom of the aquarium, occasionally seizing a few other larvæ and swallowing them. From our experiments there is little evidence of a selection of one particular species of mosquito larva. The selection of the mosquito larva in preference to water tigers, *Notonecta*, shrimps, spiders, daphnids and vegetable food, is attributable, I believe, to the stimulus of the extremely active mosquito larva to the visual sense of the fish. The fish always selected motile larvæ in preference to dead or quiescent ones: they chose the larvæ as they came to the surface to breathe or seized them as they were sinking. While it is true that the fish also ate dead larvæ and those which were quietly resting at the bottom of the jar, they also seized other animals, bits of alga, in fact almost anything which appealed to the eye. The olfactory and gustatory senses came into play in the rejection of unsuitable or distasteful food.

Smell, I maintain, is a secondary sense in the capture of mosquito larvæ by the killifish, *Fundulus heteroclitus*.

### CONCLUSIONS

The greatest natural enemy of the salt-marsh mosquito is the barred killifish, *Fundulus heteroclitus*. It also eats many green-head flies.

*Fundulus heteroclitus* captures larvæ, pupæ and adults of the mosquito, eating as many as 50 a day and killing many more.

The vast hordes of fishes which migrate to the shallows and even into almost fresh water render the species especially formidable.

The number of enemies of the mosquito which are eaten by *Fundulus heteroclitus* is negligible and is more than compensated for by the great preponderance of mosquitoes in the diet of the fish.

The ease with which *Fundulus* may be artificially fertilized and the remarkable vigor and resistance of the young embryos make the stocking of pools and streams with this species a simple matter.

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ANALYSES OF MATERIALS SOLD AS INSECTICIDES AND FUNGICIDES  
FOR 1916

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NEW JERSEY

AGRICULTURAL

**Experiment Stations**

**Bulletin 301**

New Brunswick, N. J.

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# NEW JERSEY

## AGRICULTURAL EXPERIMENT STATIONS,

### BULLETIN 301

October 2, 1916

#### ANALYSES OF MATERIALS SOLD AS INSECTICIDES AND FUNGICIDES FOR 1916

By

CHARLES S. CATHCART, *State Chemist*, and

RALPH L. WILLIS, *Assistant Chemist*

The law of New Jersey entitled "An Act to Regulate the Sale of Insecticides," Chapter 89, Session 1912, requires an annual inspection of the insecticides sold in this state. In accordance with this requirement the inspection for the year 1916 was made, and the results obtained are herewith presented.

#### REGISTRATIONS

During the year the following manufacturers registered 198 brands of materials which they intended to offer for sale:

Allen Manufacturing Co. ....	Quakertown, N. J.
George M. Andrews & Son .....	Woodstown, N. J.
Ansbacher Insecticide Co. ....	New York City.
Aphine Manufacturing Co. ....	Madison, N. J.
Avri Chemical Co. ....	Jersey City, N. J.
E. J. Barry .....	New York City.
James A. Blanchard Co. ....	New York City.
Bowker Insecticide Co. ....	Boston, Mass.
Cinnakol Chemical Sales Co. ....	Bayonne, N. J.
Corona Chemical Co. ....	Milwaukee, Wis.
Danforth Chemical Co. ....	Leominster, Mass.
F. W. Devoe & C. T. Raynolds Co. ....	New York City.
The Dow Chemical Co. ....	Midland, Mich.
Felton, Sibley & Co., Inc. ....	Philadelphia, Pa.
Samuel H. French & Co. ....	Philadelphia, Pa.
Garret Oil Co. ....	Philadelphia, Pa.
Grasselli Chemical Co. ....	Cleveland, O.
Hammond's Paint & Slug Shot Works .....	Beacon, N. Y.

The Handy Torch Co. ....	Utica, N. Y.
Hemingway & Co., Inc. ....	Bound Brook, N. J.
Morris Herrmann & Co. ....	New York City.
Interstate Chemical Co. ....	Jersey City, N. J.
F. F. X. Irsa ....	Amagansett, N. Y.
The Kil-Tone Co. ....	Newark, N. J.
Fred L. Lavanburg ....	New York City.
Arthur Laver ....	Bernardsville, N. J.
Lebanon Chemical Co. ....	Lebanon, Pa.
Leggett & Brother ....	New York City.
Lehn & Fink ....	New York City.
John Lucas & Co., Inc. ....	Gibbsboro, N. J.
McCormick & Co., Inc. ....	Baltimore, Md.
Mechling Bros. Manufacturing Co. ....	Camden, N. J.
A. Mendleson's Sons ....	Albany, N. Y.
Merrimac Chemical Co. ....	Boston, Mass.
The Modoc Co., Inc. ....	Fernwood, Pa.
Niagara Sprayer Co. ....	Middleport, N. Y.
Pfeiffer Color Co., Inc. ....	New York City.
The Plantlife Co. ....	New York City.
Powers-Weightman-Rosengarten Co. ....	Philadelphia, Pa.
B. G. Pratt Co. ....	New York City.
The Rex Company ....	Rochester, N. Y.
Riches, Piver & Co. ....	Hoboken, N. J.
Schering & Glatz ....	New York City.
Schieffelin & Co. ....	New York City.
Sherwin-Williams Co. ....	Cleveland, O., and Newark, N. J.
Smith, Kline & French Co. ....	Philadelphia, Pa.
Sterling Chemical Co. ....	Cambridge, Mass.
The H. A. Stoothoff Co. ....	York, Pa.
Thomsen Chemical Co. ....	Baltimore, Md.
Vreeland Chemical Co. ....	Little Falls, N. J.

### INSPECTION

It is our practice, when collecting samples of insecticides, to secure, if possible, the materials as sold in original packages as well as samples from the larger shipments, in order to ascertain the composition of the materials when sold in small or large quantities.

Eighty samples were secured by one of our regular inspectors, 74 of which were examined and consisted of:

15	samples of	Paris green.
23	" "	lead arsenate.
5	" "	lime-sulphur.
6	" "	Bordeaux mixture.
25	" "	miscellaneous brands.

## PARIS GREEN

Sample Number	Manufacturer or Jobber and Trade Mark or Brand	Weight Claimed for Package	Net Weight of Material in Package	Arsenious Oxide				Copper Oxide
				Total		Water-soluble		
				Found	Guaranteed	Found	Guaranteed less than	
		oz.	oz.	%	%	%	%	%
16004	Geo. M. Andrews & Son, Woodstown, N. J. Paris Green .....	.....	....	55.23	50.00	2.21	3.00	29.78
16007	Ansbacher Insecticide Co., New York City. Triangle Brand Paris Green .....	.....	.....	55.66	50.00	0.98	3.50	30.25
16057	Avri Chemical Co., Jersey City, N. J. Paris Green .....	4.0	4.2	55.45	50.00	1.08	3.50	29.85
16032	E. J. Barry, New York City. Paris Green .....	16.0	16.0	55.53	50.00	1.84	3.50	29.46
16029	Jas. A. Blanchard Co., New York City. Lion Brand Paris Green .....	.....	.....	56.33	50.00	1.23	3.50	29.69
16078	F. W. DeVoe & C. T. Reynolds Co., New York City. C. T. Reynolds Co.'s Paris Green.....	.....	.....	56.02	50.00	1.21	3.50	30.09
16033	Felton, Sibley & Co., Inc., Philadelphia, Pa. Paris Green .....	4.0	4.6	55.97	50.00	1.35	3.50	29.69
16041	Morris Hermann & Co., New York City. Hi-Grade Pure Paris Green .....	.....	.....	56.76	50.00	1.11	3.50	30.33
16062	Fred L. Lavanburg, New York City. Star Brand Paris Green .....	.....	.....	55.42	*	1.33	*	29.22
16059	Leggett & Bro., New York City. Anchor Brand Paris Green .....	.....	.....	56.20	50.00	1.33	3.50	29.30
16080	Anchor Brand Paris Green .....	4.0	4.2	55.78	50.00	1.45	3.50	29.78
16026	John Lucas & Co., Gibbsboro, N. J. Warranted Strictly Pure Paris Green..	4.0	3.9	55.60	50.00	1.11	3.50	29.62
16051	Warranted Strictly Pure Paris Green..	.....	.....	56.27	50.00	0.86	3.50	30.17
16071	I. Pfeiffer, New York City. Strictly Pure Paris Green .....	16.0	16.2	55.18	50.00	1.45	3.50	29.46
16027	Sherwin-Williams Co., Cleveland, O. Paris Green .....	.....	.....	55.66	50.00	1.72	3.50	29.78

Section 4 of the law states that a Paris green shall be deemed to be adulterated if it does not contain (1) at least 50 per cent of arsenious oxide, and (2) if it contains arsenic in water-soluble form equivalent to more than 3.5 per cent arsenious oxide.

Fifteen samples of Paris green were examined, six of which were obtained in original packages and the remainder represented larger shipments. All of the samples were examined for the content of total arsenious oxide, water-soluble arsenic compounds and copper oxide. In addition to the chemical examination, the samples received in original packages were carefully weighed in order to

\* Guarantee not stated.

ascertain the net weight of the insecticide delivered. The exact weights as found are tabulated and it will be noted that in five instances the net weight equalled or exceeded the weight claimed. The sixth sample, which was supposed to contain 4 ounces, was a fraction short of the weight claimed.

All of the samples contained more than 50 per cent of total arsenious oxide and less than 3.5 per cent of water-soluble arsenious oxide, and, consequently, all of the samples satisfied the standard as required by the law. Pure Paris green contains 1.87 parts of arsenious oxide to 1 part of copper oxide. An excess of white arsenic would cause this ratio to be wider. If the samples are judged on this basis, Samples 16029, 16059 and 16062 evidently contain an excess of white arsenic, since the ratio of the arsenious oxide to the copper oxide as found is 1.93, 1.92 and 1.90 to 1.00, respectively.

### LEAD ARSENATE

#### Lead Arsenate—Paste—Original Packages

Sample Number	Manufacturer or Jobber and Trade Mark or Brand	Arsenic Oxide					Lead Oxide	Soluble Impurities (exclusive of Soluble Arsenic Oxide)
		Water	Total		Water-soluble			
			Found	Guaranteed	Found	Guaranteed less than		
		%	%	%	%	%	%	%
16024	Ansbacher Insecticide Co., New York City. Triangle Brand Arsenate of Lead Paste.	46.00	16.31	15.00	0.53	0.50	36.19	1.17
16035	Grasselli Chemical Co., Cleveland, O. Grasselli Arsenate of Lead Paste.....	49.81	16.09	15.00	0.46	0.50	32.61	0.69
16077	Hemingway & Co., Inc., Bound Brook, N. J. Lead Arsenate Paste .....	40.26	18.72	15.00	0.24	0.50	39.76	0.74
16075	Interstate Chemical Co., Jersey City, N. J. Key Brand Arsenate of Lead .....	42.53	18.00	15.00	0.15	0.75	37.87	0.64
16065	Key Brand Arsenate of Lead .....	46.66	17.26	15.00	0.30	0.75	34.56	0.74
	Powers-Weightman-Rosengarten Co., Phila- delphia, Pa.							
16079	Lead Arsenate Paste .....	49.03	16.24	15.00	0.21	0.75	33.24	0.53

#### Lead Arsenate—Paste—Samples of Larger Shipments

		%	%	%	%	%	%	%
16028	Grasselli Chemical Co., Cleveland, O. Grasselli Arsenate of Lead Paste.....	49.80	15.77	15.00	0.50	0.50	32.86	1.31
16070	Sherwin-Williams Co., Cleveland, O. New Process Arsenate of Lead.....	48.00	14.20	12.50	0.48	0.75	36.17	1.00
16013	Thomsen Chemical Co., Baltimore, Md. Orchard Brand Arsenate of Lead T P.	33.15	16.91	12.50	0.66	0.75	48.34	1.44
16014	Orchard Bd. Arsenate of Lead Standard	43.34	16.97	15.00	0.72	0.75	36.56	1.43

## Lead Arsenate—Powder

Sample Number	Manufacturer or Jobber and Trade Mark or Brand	Arsenic Oxide				Lead Oxide	Soluble Impurities (exclusive of Soluble Arsenic Oxide)
		Total		Water-soluble			
		Found	Guaranteed	Found	Guaranteed less than		
		%	%	%	%	%	%
16025	Ansbacher Insecticide Co., New York City. Triangle Brand Arsenate of Lead Dry.	30.07	30.00	1.13	1.00	67.14	1.32
16034	Corona Chemical Co., Newark, N. J. Corona Dry Arsenate of Lead .....	32.90	*30.00	0.57	*0.75	64.40	1.48
16068	Corona Dry Arsenate of Lead .....	32.97	30.00	0.56	*0.75	63.95	1.09
16072	Grasselli Chemical Co., Cleveland, O. Grasselli Arsenate of Lead Powdered..	27.17	27.00	0.71	1.00	70.18	1.04
16036	Handy Torch Co., Utica, N. Y. Arsenate of Lead Powdered .....	26.04	*20.00	0.71	*1.53	67.39	2.89
16042	Interstate Chemical Co., Jersey City, N. J. Key Brand Powdered Arsenate of Lead.	30.56	31.00	0.57	0.75	66.21	1.93
16063	Kiltone Co., Newark, N. J. Green Cross Dry Powdered Arsenate of Lead .....	32.47	31.00	0.71	0.66	64.47	1.89
16055	Powers-Weightman-Rosengarten Co., Phila- delphia, Pa. Lead Arsenate Powder .....	32.16	30.00	4.39	1.50	60.47	3.41
16061	Sherwin-Williams Co., Cleveland, O. Dry Powdered Arsenate of Lead.....	32.55	30.00	0.64	1.00	64.31	0.91
16030	Dry Powdered Arsenate of Lead.....	32.33	30.00	0.71	1.00	63.88	1.34
16020	Thomsen Chemical Co., Baltimore, Md. Orchard Brand Powdered Arsenate of Lead—Standard .....	30.28	29.00	1.27	*1.50	65.07	2.08
16001	Vreeland Chemical Co., Little Falls, N. J. Electro Dry Powdered Arsenate of Lead	31.49	31.00	0.42	*0.75	63.36	1.58
16050	Electro Dry Powdered Arsenate of Lead	31.39	31.00	0.71	0.75	62.62	1.44

\* Calculated from guarantee given in terms of metallic arsenic.

Twenty-three samples of lead arsenate were examined, 10 of which were in paste form and the remainder were dry powders. Ten samples were secured in original packages and in each instance the net weight of the materials equalled or exceeded the weight claimed.

In accordance with the standard as given in the law, a lead arsenate would be deemed adulterated (1) if it contains more than 50 per cent of water, (2) if it contains less than 12.5 per cent of arsenic oxide, and (3) if it contains water-soluble arsenic compounds equivalent to more than 0.75 per cent of arsenic oxide.

The records show that all of the samples met the requirements of the law in regard to the content of water and total arsenic oxide,

and all of the samples in paste form were satisfactory in regard to the content of arsenic in water-soluble forms. Two samples of the powdered arsenate, Nos. 16025 and 16055, exceeded the maximum guarantees given for the water-soluble arsenic.

Particular attention is called to Sample 16055. It will be noticed that this sample contained 4.39 per cent of water-soluble arsenic oxide and 3.41 per cent of soluble impurities other than soluble arsenic oxide. This brand was located last year and the manufacturers were informed in regard to the violation of the law if they sold such a mixture as lead arsenate. From the correspondence it was assumed that the product had been withdrawn until Sample 16055 was received from a dealer in New Brunswick, N. J. The dealer was interviewed and he stated that the material was received this year and was not stock carried over from last year. He was notified by the department not to make any future sales of the material.

The question was again taken up with the manufacturer, who gave the following information:—"that as the goods were manufactured previous to the material concerning which we corresponded with you last year, we find upon investigation that it had long ago been called in. By this we mean to indicate that we have discontinued the sale of an article of this character, have called it in from where we knew we could find it, and have set it aside in our warehouse pending remanufacture or other disposition."

We were unable to locate any other shipment of this brand and, consequently, could not secure any additional information relating to the question.

#### LIME-SULPHUR SOLUTIONS

16018. Lime-Sulphur Solution. Manufactured by Bowker Insecticide Co., Boston, Mass.

16067. Lime-Sulphur Solution. Manufactured by Grasselli Chemical Co., Cleveland, O.

16039. Lime-Sulphur Solution. Manufactured by Mechling Brothers Mfg. Co., Camden, N. J.

16069. Lime-Sulphur Solution. Manufactured by Sherwin-Williams Co., Cleveland, O.

16017. Lime-Sulphur Solution. Manufactured by Thomsen Chemical Co., Baltimore, Md.

Sample No.	Sulphur in Solution		Density Degrees Beaumé Found %
	Found %	Guaranteed %	
16018	25.82	.....	32.0
16067	25.60	25.00	31.0
16039	26.30	24.00	33.0
16069	30.71	21.00	37.5
16017	26.49	25.00	33.0

## BORDEAUX MIXTURES

16022. Target Brand Bordeaux Mixture. Manufactured by Interstate Chemical Co., Jersey City, N. J.

16074. Anchor Brand Bordeaux Mixture. Manufactured by Leggett & Brother, New York City.

Sample No.	Water %	Copper	
		Found %	Guaranteed %
16022	72.14	4.15	4.00
16074	54.15	5.70	4.50

16037. Target Brand Bordeaux Mixture, Powdered. Manufactured by Interstate Chemical Co., Jersey City, N. J.

16056. Dry Bordeaux Mixture. Manufactured by Leggett & Brother, New York City.

16045. Fungi-Bordo. Manufactured by Sherwin-Williams Co., Cleveland, O.

16058. Sterlingworth Dry Bordeaux Mixture. Manufactured by Sterling Chemical Co., Cambridge, Mass.

Sample No.	Copper	
	Found %	Guaranteed %
16037	10.47	10.00
16056	12.22	11.00
16045	11.38	11.00
16058	9.88	10.00

## MISCELLANEOUS MATERIALS

16048. Triangle Brand "Ansbor" Green. Manufactured by Ansbacher Insecticide Co., New York City. Sample from 50-pound package.

	Found %	Guaranteed %
Total arsenic (metallic) .....	11.46	11.00
Water-soluble arsenic (metallic) .....	1.77	1-3.00
Copper .....	19.31	.....

<sup>1</sup> Guaranteed "less than" percentage given.

16008. Triangle Brand "Adheso" Green Label. Manufactured by Ansbacher Insecticide Co., New York City. Sample from 100-pound package.

	Found %	Guaranteed %
Water .....	60.00	....
Total arsenic (metallic) .....	9.43	5.50
Water-soluble arsenic (metallic) .....	0.16	<sup>1</sup> 0.50
Copper .....	3.92	....
Lead oxide .....	19.71	....

<sup>1</sup> Guaranteed "less than" percentage given.

16019. Pyrox. Manufactured by Bowker Insecticide Co., Boston, Mass. Sample from 1-pound package.

16073. Pyrox. Manufactured by Bowker Insecticide Co., Boston, Mass. Sample from 1-pound package.

	Sample 16019		Sample 16073	
	Found %	Guaranteed %	Found %	Guaranteed %
Water .....	58.16	.....	61.40	.....
Total arsenic (metallic) ...	4.20	3.42	5.48	3.42
Water-sol. arsenic (metallic)	0.41	<sup>2</sup> 0.75	0.30	<sup>2</sup> 0.75
Lead oxide .....	15.15	13.00	18.50	13.00
Copper .....	2.57	1.50	2.51	1.50

<sup>2</sup> Guaranteed "not more than" percentage given.

16040. Caascu. Manufactured by Hemingway & Co., Inc., Bound Brook, N. J. Sample from 5-pound package.

16076. Caascu. Manufactured by Hemingway & Co., Inc., Bound Brook, N. J. Sample from 5-pound package.

	Sample 16040		Sample 16076	
	Found %	Guaranteed %	Found %	Guaranteed %
Total arsenic (metallic) ...	16.57	20.00	18.18	17.00
Water-sol. arsenic (metallic)	1.00	<sup>2</sup> 0.75	1.23	<sup>2</sup> 0.75
Copper .....	7.28	.....	7.15	.....

<sup>2</sup> Guaranteed "not more than" percentage given.

16044. Blue Label Tonicide. Manufactured by Morris Herrmann & Co., New York City. Sample from 100-pound package.

	Found %	Guaranteed %
Water .....	57.25	....
Total arsenic (metallic) .....	5.48	3.70
Water-soluble arsenic (metallic) .....	0.15	<sup>1</sup> 0.25
Lead oxide .....	13.51	....
Copper .....	5.65	....

<sup>1</sup> Guaranteed "not more than" percentage given.

16023. Target Brand Bordo-Lead. Manufactured by Interstate Chemical Co., Jersey City, N. J. Sample from 1-pound package.

	Found %	Guaranteed %
Water .....	61.11	....
Total arsenic oxide .....	8.73	7.50
Water-soluble arsenic oxide .....	0.21	<sup>1</sup> 0.50
Lead oxide .....	15.08	....
Copper .....	2.26	....

<sup>1</sup> Guaranteed "not more than" percentage given.

16012. Improved Kil-tone. Manufactured by The Kil-Tone Co., Newark, N. J. Sample from 50-pound package.

16060. Improved Kil-tone. Manufactured by The Kil-Tone Co., Newark, N. J. Sample from 50-pound package.

	Sample 16012		Sample 16060	
	Found %	Guaranteed %	Found %	Guaranteed %
Water .....	40.79	.....	46.01	.....
Total arsenic (metallic)...	10.36	5.00	8.99	5.00
Water-sol. arsenic (metallic)	0.24	<sup>1</sup> 0.55	0.26	<sup>1</sup> 0.55
Lead oxide .....	30.47	.....	28.07	.....
Copper .....	3.04	.....	2.53	.....

<sup>1</sup> Guaranteed "not more than" percentage given.

16010. Green Cross Sulpho-arsenate Powder. Manufactured by The Kil-Tone Co., Newark, N. J. Sample from 100-pound package.

16049. Green Cross Sulpho-arsenate Powder. Manufactured by The Kil-Tone Co., Newark, N. J. Sample from 100-pound package.

	Sample 16010		Sample 16049	
	Found %	Guaranteed %	Found %	Guaranteed %
Total arsenic (metallic)...	14.79	10.10	15.99	10.10
Water-sol. arsenic (metallic)	0.85	<sup>1</sup> 0.66	0.57	<sup>1</sup> 0.66
Lead oxide .....	33.65	.....	32.68	.....
Sulphur .....	48.93	48.00	49.46	48.00

<sup>1</sup> Guaranteed "not more than" percentage given.

16038. Dry Bordeaux Mixture and Paris Green Compound. Manufactured by Leggett & Brother, New York City. Sample from 1-pound package.

	Found %	Guaranteed %
Total arsenic (metallic) .....	14.53	12.50
Water-soluble arsenic (metallic) .....	1.77	3.00
Copper .....	15.41	20.00

16031. Mechling's Hydroxide, Green Label, Special No. 2. Manufactured by Mechling Bros. Mfg. Co., Camden, N. J. Sample from 50-pound package.

	Found %	Guaranteed %
Water .....	50.91	.....
Total arsenic (metallic) .....	6.08	6.50
Water-soluble arsenic (metallic) .....	0.37	<sup>1</sup> 0.50
Lead oxide .....	22.01	.....
Copper .....	1.32	1.59

<sup>1</sup> Guaranteed "not more than" percentage given.

16006. Cal-Arsenate, Powdered. Manufactured by Riches, Piver & Co., New York City. Sample from 100-pound package.

16047. Cal-Arsenate, Powdered. Manufactured by Riches, Piver & Co., New York City. Sample from 50-pound package.

	Sample 16006		Sample 16047	
	Found %	Guaranteed %	Found %	Guaranteed %
Total arsenic oxide .....	45.07	45.00	42.31	43.00
Water-soluble arsenic oxide	0.57	<sup>1</sup> 1.00	1.42	<sup>2</sup> 1.15

<sup>1</sup> Guaranteed "not more than" percentage given.

<sup>2</sup> Calculated from guarantee for metallic arsenate.

16005. Tuber-tonic. Manufactured by Sherwin-Williams Co., Cleveland, O. Sample from 1-pound package.

16046. Tuber-tonic. Manufactured by Sherwin-Williams Co., Cleveland, O. Sample from 25-pound package.

	Sample 16005		Sample 16046	
	Found %	Guaranteed %	Found %	Guaranteed %
Total arsenic (metallic)...	25.48	24.00	24.81	24.00
Water-sol. arsenic (metallic)	0.90	<sup>1</sup> 3.00	0.62	<sup>1</sup> 3.00
Copper .....	22.36	.....	22.36	.....

<sup>1</sup> Guaranteed "not more than" percentage given.

16015. Orchard Brand Arsenite of Zinc, Powdered. Manufactured by Thomsen Chemical Co., Baltimore, Md. Sample from 100-pound package.

16003. Orchard Brand Arsenite of Zinc, Powdered. Manufactured by Thomsen Chemical Co., Baltimore, Md. Sample from 300-pound shipment.

	Sample 16015		Sample 16003	
	Found %	Guaranteed %	Found %	Guaranteed %
Total arsenic (metallic)...	30.65	30.50	32.08	30.50
Water-sol. arsenic (metallic)	0.27	<sup>1</sup> 1.00	0.46	<sup>1</sup> 1.00

<sup>1</sup> Guaranteed "not more than" percentage stated.

16002. Orchard Brand Arsenite of Zinc. Manufactured by Thomsen Chemical Co., Baltimore, Md. Sample from 100-pound package.

	Found %	Guaranteed %
Water .....	30.39	.....
Total arsenic (metallic) .....	11.41	7.63
Water-soluble arsenic (metallic) .....	0.11	<sup>1</sup> 0.57
Copper .....	7.38	4.50

<sup>1</sup> Guaranteed "not more than" percentage stated.

16016. Orchard Brand Atomic Sulphur. Manufactured by Thomsen Chemical Co., Baltimore, Md. Sample from 25-pound package.

	Found %	Guaranteed %
Water .....	41.51	.....
Sulphur .....	53.57	45.00

16011. Electro Bordo-Lead Mixture. Manufactured by Vreeland Chemical Co., Little Falls, N. J. Sample from 1-pound package.

16052. Electro Bordo-Lead Mixture. Manufactured by Vreeland Chemical Co., Little Falls, N. J. Sample from 1-pound package.

	Sample 16011		Sample 16052	
	Found %	Guaranteed %	Found %	Guaranteed %
Water .....	42.86	.....	42.25	.....
Total arsenic (metallic)...	7.01	3.64	10.10	5.45
Water-sol. arsenic (metallic)	0.11	<sup>1</sup> 0.50	0.17	<sup>1</sup> 0.50
Lead oxide .....	22.01	.....	25.76	.....
Copper .....	3.16	.....	2.81	.....

<sup>1</sup> Guaranteed "not more than" percentage stated.

16053. Electro Micro  $\frac{1}{2}$  &  $\frac{1}{2}$ . Manufactured by Vreeland Chemical Co., Little Falls, N. J. Sample from 100-pound package.

	Found %	Guaranteed %
Total arsenic oxide .....	14.36	12.60
Water-soluble arsenic oxide .....	0.57	<sup>1</sup> 0.77
Lead oxide .....	29.49	.....
Sulphur .....	39.71	32.00

<sup>1</sup> Guaranteed less than 0.50 metallic arsenic.

NEW JERSEY

AGRICULTURAL

**Experiment Stations**

BULLETIN 302

New Brunswick, N. J.

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# NEW JERSEY

## AGRICULTURAL EXPERIMENT STATIONS

### BULLETIN 302

November 1, 1916

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#### RESULTS OF SEED INSPECTION 1915-1916

By

JOHN P. HELYAR, *State Seed Analyst\**

During the past two years more attention has been given to the vegetable seeds offered in bulk in the New Jersey markets, and inspection of official samples are largely from this class of seed. This bulletin is intended to report the results of analyses of such official samples as have been received through the efforts of the Seed Laboratory during this period. Owing to the increasing demand for service in the testing of unofficial samples it has been impossible to devote as much time to official inspection, though the results reported may be assumed fairly to indicate existing conditions.

#### ANALYSIS OF OFFICIAL SAMPLES—1915

The analyses given in the following tables represent the quality of samples collected during the year ending October 31, 1915.

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\* The analyses of the samples herein reported were made in part by Mr. Robert Schmidt, who resigned May 1, 1915, by Mr. A. C. Foster and Mr. H. E. Carney, who resigned January 1, 1916, and September 1, 1916, respectively, and also by Miss Nevada S. Evans, who is now engaged as Assistant Seed Analyst.

TABLE I

## ANALYSIS OF RED CLOVER SEED

No.	Name and Source of Sample	Purity Per cent	Inert Matter Per cent	Foreign Seed Per cent	No. of Species of Foreign Seed	Dodder	Canada Thistle	Horse Nettle
3000	H. W. Kline, Middlebush .....	99.14	0.37	0.49	3	.....	.....	.....
3019	J. W. Briant, Salem .....	98.28	0.99	0.65	8	.....	.....	.....
3031	R. W. Smith Co., Elmer .....	98.30	1.06	0.54	8	.....	.....	.....
3060	L. Sheard, Vineland .....	98.91	0.55	0.54	6	.....	.....	.....
3081	Serrata & Sons, Bridgeton .....	98.80	0.69	0.51	3	.....	.....	.....
3130	J. E. Blake & Co., Pleasantville .....	99.36	0.45	0.18	5	.....	.....	.....
3159	Taylor Bros., Camden .....	99.29	0.44	0.26	4	.....	.....	.....
3179	Theo. Messenger, Egg Harbor .....	99.48	0.31	0.20	5	.....	.....	.....
3213	A. S. Clark & Son, Pitman .....	98.35	0.64	0.98	6	.....	.....	.....
3216	South Jersey Farmers' Ex., Woodstown .....	99.00	0.80	0.19	4	.....	.....	.....
3225	M. C. Ribsam, Trenton .....	99.48	0.34	0.17	5	.....	.....	.....
3236	Anderson Bros., Yardville .....	96.40	1.32	2.27	12	2	.....	.....
3239	M. C. Ribsam, Trenton .....	98.82	0.80	0.36	6	.....	.....	.....
3243	J. B. Hill, Hopewell .....	99.07	0.63	0.28	3	.....	.....	.....
3256	S. E. Burr Hardware Co., Bordentown .....	98.79	0.60	0.60	6	.....	.....	.....
3259	Burlington Supply Co., Burlington .....	98.05	1.09	0.84	5	.....	.....	.....
3275	A. P. Wooley, Matawan .....	95.57	2.73	1.69	8	9	.....	.....
3277	J. R. Wyckoff, Princeton Junction .....	99.80	0.06	0.04	1	.....	.....	.....
3283	J. Fritz & Son, Farmingdale .....	98.25	0.76	0.97	5	.....	.....	.....
3294	G. M. Harris, Matawan .....	96.03	1.80	2.15	4	.....	.....	.....
3295	G. V. Vandenbergh, Englishtown .....	98.97	0.78	0.23	4	.....	.....	.....
3315	F. B. King, Mt. Holly .....	98.00	1.95	0.39	2	.....	.....	.....
3320	R. Hance & Sons, Red Bank .....	98.93	0.72	0.33	4	.....	.....	.....
3322	H. W. Doughten, Moorestown .....	98.86	0.65	0.47	4	.....	.....	.....
3323	E. R. Kirby, Wrightstown .....	99.72	0.13	0.14	3	.....	.....	.....
3337	H. J. Morton, Elizabeth .....	97.79	1.46	0.73	4	.....	.....	.....
3351	D. V. Perrine, Freehold .....	97.48	1.70	0.81	8	.....	.....	.....
3354	J. H. Johnson, Washington .....	98.81	0.64	0.54	6	.....	.....	.....
3360	Muzzy Bros., Paterson .....	98.46	1.23	0.28	3	.....	.....	.....
3370	A. G. Phillips & Son, Paterson .....	94.56	3.47	1.93	4	.....	.....	.....
3385	J. F. Noll & Co., Newark .....	98.28	1.06	0.64	2	.....	.....	.....
3386	Muzzy Bros., Paterson .....	98.01	1.41	0.57	5	.....	.....	.....
3396	Harte & Co., Paterson .....	98.38	0.87	0.73	7	.....	.....	.....
3399	W. F. Howell, Newton .....	98.99	0.61	0.38	4	1	.....	.....
3408	S. H. Berry Hardware Co., Dover .....	97.04	1.55	1.40	8	.....	.....	.....
3411	W. W. Woodward, Newton .....	96.50	2.27	1.21	5	.....	.....	.....
3420	Terhune & Opie, Bound Brook .....	98.17	0.75	1.07	8	.....	.....	.....
3427	State Home, Jamesburg .....	97.80	1.30	0.85	5	.....	.....	.....
3428	State Home, Jamesburg .....	97.00	1.07	1.80	5	.....	.....	.....
3429	State Home, Jamesburg .....	97.50	1.50	0.80	5	.....	.....	.....

TABLE II

## ANALYSIS OF ALFALFA SEED

No.	Name and Source of Sample	Purity Per cent	Inert Matter Per cent	Foreign Seed Per cent	No. of Species of Foreign Seed	Dodder	Russian Knapweed
3078	H. O. Newcomb, Bridgeton .....	99.20	0.52	0.27	7	.....	180
3119	Taylor Bros., Camden .....	99.50	0.28	0.16	4	.....	90
3121	Taylor Bros., Camden .....	98.80	0.51	0.67	5	180	.....
3139	Taylor Bros., Camden .....	99.60	0.20	0.12	3	.....	.....
3173	South Jersey Farmers' Ex., Woodstown	99.60	0.20	0.12	3	.....	.....
3174	South Jersey Farmers' Ex., Woodstown	99.40	0.58	0.06	2	.....	.....
3234	Anderson Bros., Yardville .....	99.30	0.40	0.30	7	90	.....
3235	M. C. Ribsam, Trenton .....	98.80	0.89	0.27	1	.....	.....
3261	*Burlington Supply Co., Burlington....	80.10	1.20	18.60	3	.....	.....
3278	J. R. Wyckoff, Princeton Junction.....	99.60	0.23	0.08	1	.....	.....
3279	R. Hance & Sons, Red Bank .....	99.30	0.36	0.26	5	90	.....
3289	G. M. Harris, Matawan .....	97.60	0.80	1.51	3	.....	.....
3292	D. V. Perrine, Freehold .....	98.10	1.73	0.10	1	.....	.....
3300	G. D. Vandenberg, Englishtown .....	98.90	0.69	0.32	1	.....	.....
3314	F. B. King, Mt. Holly .....	97.90	0.06	0.13	2	.....	.....
3317	S. E. Burr Hardware Co., Bordentown.	98.70	0.50	0.58	6	.....	270
3353	W. W. Woodward, Newton .....	97.50	0.80	1.78	3	.....	.....
3356	J. H. Johnson, Washington .....	98.80	0.58	0.50	3	.....	.....
3373	W. Kroner, Phillipsburg .....	99.05	0.41	0.06	2	.....	.....
3378	S. H. Berry Hardware Co., Dover.....	98.40	0.99	0.55	3	.....	.....
3382	Muzzy Bros., Paterson .....	99.70	0.02	0.22	2	.....	.....
3378	J. F. Noll & Co., Newark .....	98.80	0.79	0.53	5	.....	90
3401	A. G. Phillips & Sons, Morristown.....	98.40	0.57	0.98	4	.....	.....
3423	Terhune & Opie, Bound Brook .....	98.40	0.70	0.91	3	.....	.....

\* Red Clover 17.8%

TABLE III  
ANALYSIS OF CRIMSON CLOVER SEED

No.	Number and Source of Sample	Purity Per cent	Inert Matter Per cent	Foreign Seed Per cent	No. of Species of Foreign Seed
3137	J. E. Blake & Co., Pleasantville .....	97.65	0.85	1.12	2
3141	Taylor Bros., Camden .....	97.23	1.74	0.35	5
3182	South Jersey Farmers' Ex., Woodstown .....	96.60	2.80	1.50	6
3205	A. S. Clark & Son, Pitman .....	97.38	2.01	0.65	4
3231	Anderson Bros., Yardville .....	95.86	3.06	0.91	7
3252	Burlington Supply Co., Burlington.....	96.52	3.55	1.04	9
3281	D. V. Perrine, Freehold .....	97.96	1.19	0.75	6
3346	H. W. Doughten, Moorestown .....	95.95	3.66	0.55	6
3381	Muzzy Bros., Paterson .....	96.70	2.75	0.49	5
3402	A. G. Phillips & Son, Morristown.....	94.43	4.64	0.84	6

TABLE IV  
ANALYSIS OF COWPEA SEED

No.	Name and Source of Sample	Varietal Name	Germination Per cent
3039	S. Pogust & Sons, Vineland .....	Whippoorwill .....	8
3181	South Jersey Farmers' Exchange, Woodstown .....	Whippoorwill .....	45
3288	J. Fritz & Son, Farmingdale .....	Whippoorwill .....	97
3312	F. B. King, Mount Holly .....	Whippoorwill .....	78
3344	H. J. Morton, New Egypt .....	Whippoorwill .....	84
3154	Taylor Bros., Camden .....	Grew Crowder .....	25
3176	H. K. Shoemaker, Swedesboro .....	Grey Crowder .....	24
3248	Burlington Supply Co., Burlington...	Grey Crowder .....	90
3264	Anderson Bros., Yardville .....	Grey Crowder .....	94
3331	H. W. Doughten, Moorestown .....	Grey Crowder .....	90
3177	H. K. Shoemaker, Swedesboro.....	Black .....	97
3228	Anderson Bros., Yardville .....	Black .....	95
3186	H. K. Shoemaker, Swedesbor .....	Brown Stock .....	82
3257	Burlington Supply Co., Burlington...	New Era .....	48

TABLE V  
ANALYSIS OF CANADA FIELD PEA SEED

No.	Source of Sample	Germination, Per cent
3007	Serrata & Sons, Bridgeton .....	94
3045	H. O. Newcomb, Bridgeton .....	87
3140	Taylor Bros., Camden .....	91
3284	George M. Harris, Matawan .....	97
3301	A. P. Wooley, Matawan .....	95
3349	J. Fritz & Son, Farmingdale .....	90
3374	Lambert & Kerr, Lambertville .....	78

TABLE VI  
ANALYSIS OF BEAN SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3006	Eldridge & Phillips, Cape May.....	Golden Wax .....	97
3010	J. W. Briant, Salem .....	Golden Wax .....	98
3015	J. W. Briant, Salem .....	Golden Wax .....	93
3016	J. W. Briant, Salem .....	Golden Wax, Rustproof .....	95
3035	E. L. Ross, Cape May Court House..	Golden Wax .....	96
3038	S. Pogust & Sons, Vineland.....	Golden Wax .....	65
3085	E. E. Hires, Elmer .....	Golden Wax .....	91
3094	Vineland Grain Co., Vineland.....	Golden Wax .....	73
3099	Serrata & Sons, Bridgeton .....	Golden Wax .....	86
3142	J. E. Blake & Co., Pleasantville.....	Golden Wax .....	70
3183	Abbott & Company, May's Landing...	Golden Wax .....	97
3193	Wm. L. Black, Hammonton.....	Golden Wax .....	97
3204	A. S. Clark & Son, Pitman.....	Golden Wax, Rustless .....	100
3214	S. A. Stewart, Woodbury.....	Golden Wax .....	94
3054	Vineland Grain Co., Vineland.....	Black Wax .....	94
3090	A. M. Niggin, Vineland.....	Black Wax .....	86
3150	H. K. Shoemaker, Swedesboro.....	Wardell's Wax .....	100
3160	W. L. Black, Hammonton.....	Dwarf German Wax .....	92
3072	Eldridge & Phillips, Cape May.....	Stringless Green Pod .....	98
3146	J. E. Blake & Co., Pleasantville.....	Burpee's Stringless Green Pod .....	94
3157	H. K. Shoemaker, Swedesboro.....	Stringless Green Pod .....	97
3189	Wm. L. Black, Hammonton.....	Stringless Green Pod .....	99
3157	H. K. Shoemaker, Swedesboro.....	Stringless Green Pod .....	74
3017	Serrata & Sons, Bridgeton.....	Boston Goddard .....	97
3087	Serrata & Sons, Bridgeton.....	Yellow Six Weeks .....	61
3129	Abbott & Co., May's Landing.....	Mohawk .....	94
3008	Serrata & Sons, Bridgeton.....	Dwarf Horticultural .....	99
3034	Vineland Grain Co., Vineland.....	Dwarf Horticultural .....	94
3095	S. Pogust & Sons, Vineland.....	Dwarf Horticultural .....	100
3026	Eldridge & Phillips, Cape May.....	Early Red Valentine .....	99
3027	Serrata & Sons, Bridgeton.....	Early Red Valentine .....	99
3103	G. H. Warren, Tuckahoe.....	Early Red Valentine .....	100
3108	H. K. Shoemaker, Swedesboro.....	Early Red Valentine .....	99
3156	J. E. Blake & Co., Pleasantville.....	Early Red Valentine .....	37
3169	W. S. Shaw, Tuckahoe.....	Early Red Valentine .....	98
3113	Abbott & Co., May's Landing.....	Extra Early Valentine .....	100

TABLE VII

## ANALYSIS OF LIMA BEAN SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3033	E. R. Hires, Elmer.....	Fordhook .....	58
3042	Serrata & Sons, Bridgeton.....	Fordhook .....	52
3055	A. M. Niggin, Vineland.....	Fordhook Bush .....	64
3056	S. Pogust & Sons, Vineland.....	Fordhook .....	54
3123	H. K. Shoemaker, Swedesboro.....	Fordhook .....	40
3145	W. S. Shaw, Tuckahoe.....	Fordhook Bush .....	30
3148	J. E. Blake, Pleasantville.....	Fordhook Bush .....	34
3170	G. H. Warren, Tuckahoe.....	Fordhook Bush .....	74
3202	A. S. Clark & Son, Pitman.....	Fordhook .....	40
3209	S. A. Stewart, Woodbury.....	Fordhook .....	62
3425	W. F. Howell, Newton.....	Dreer's Improved .....	42
3424	W. F. Howell, Newton.....	King of the Garden .....	71
3011	R. W. Smith, Elmer.....	Large White .....	70
3152	S. A. Stewart, Woodbury.....	Large White .....	44
3093	Eldridge & Phillips, Cape May.....	Dwarf Bush .....	88

TABLE VIII

## ANALYSIS OF SWEET CORN SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3063	Eldridge & Phillips, Cape May.....	Stowell's Evergreen .....	82
3100	Vineland Grain Co., Vineland.....	Stowell's Evergreen .....	90
3102	G. H. Warren, Tuckahoe.....	Stowell's Evergreen .....	92
3110	H. K. Shoemaker, Swedesboro.....	Stowell's Evergreen .....	82
3116	S. A. Stewart, Woodbury.....	Stowell's Evergreen .....	88
3168	W. S. Shaw, Tuckahoe.....	Stowell's Evergreen .....	91
3229	Burlington Supply Co., Burlington...	Stowell's Evergreen .....	93
3028	Serrata & Sons, Bridgeton.....	Stowell's Evergreen .....	94
3043	S. Pogust & Sons, Vineland.....	Stowell's Evergreen .....	87
3044	Eldridge & Phillips, Cape May.....	Country Gentleman .....	57
3957	Vineland Grain Co., Vineland.....	Country Gentleman .....	96
3120	S. A. Stewart, Woodbury.....	Country Gentleman .....	84
3158	H. K. Shoemaker, Swedesboro.....	Country Gentleman .....	89
3163	W. S. Shaw, Tuckahoe.....	Country Gentleman .....	78
3167	J. E. Blake & Co., Pleasantville.....	Country Gentleman .....	91
3343	E. H. Berry, Toms River.....	Country Gentleman .....	70
3030	A. M. Niggin, Vineland.....	Golden Bantam .....	97
3131	J. E. Blake & Co., Pleasantville.....	Golden Bantam .....	73
3338	E. H. Berry, Toms River.....	Golden Bantam .....	91
3368	W. F. Howell, Newton.....	Golden Bantam .....	98
3112	J. E. Blake & Co., Pleasantville.....	Early Evergreen .....	91
3217	A. S. Clark & Son, Pitman.....	Early White Evergreen .....	92
3285	E. H. Berry, Toms River.....	Early Minnesota .....	88
3390	W. F. Howell, Newton.....	Early Minnesota .....	94
3050	A. M. Niggin, Vineland.....	Black Mexican .....	79
3079	Eldridge & Phillips, Cape May.....	White Corey .....	94
3153	J. E. Blake & Co., Pleasantville.....	Early Adams .....	98
3260	Burlington Supply Co., Burlington...	Champion .....	91

TABLE IX  
ANALYSIS OF PEA SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3013	J. W. Briant, Salem.....	Gradus .....	70
3020	Serrata & Sons, Bridgeton.....	Gradus .....	83
3069	Vineland Grain Co., Vineland.....	Gradus .....	68
3073	Eldridge & Phillips, Cape May.....	Gradus .....	74
3096	E. E. Hires, Elmer.....	Gradus .....	57
3124	J. E. Blake & Co., Pleasantville.....	Gradus .....	67
3149	H. K. Shoemaker, Swedesboro.....	Gradus .....	59
3210	S. A. Stewart, Woodbury.....	Gradus .....	61
3389	W. F. Howell, Newton.....	Gradus .....	78
3014	Serrata & Sons, Bridgeton.....	Telephone .....	74
3022	Eldridge & Phillips, Cape May.....	Telephone .....	63
3064	E. E. Hires, Elmer .....	Telephone .....	34
3068	J. W. Briant, Salem.....	Telephone .....	92
3092	L. Sheard, Vineland.....	Telephone .....	54
3101	R. W. Smith Co., Elmer.....	Telephone .....	56
3109	G. H. Warren, Tuckahoe.....	Telephone .....	49
3184	Abbott & Co., May's Landing.....	Telephone .....	67
3307	E. H. Berry, Toms River.....	Telephone .....	78
3024	R. W. Smith Co., Elmer.....	Thomas Laxton .....	85
3037	Pogust & Sons, Vineland.....	Thomas Laxton .....	89.5
3015	A. M. Niggin, Vineland.....	Thomas Laxton .....	81
3062	Vineland Grain Co., Vineland.....	Thomas Laxton .....	52
3059	Eldridge & Phillips, Cape May.....	Premium Gem .....	91
3066	E. L. Ross, Cape May Court House..	Premium Gem .....	68
3104	G. H. Warren, Tuckahoe.....	Premium Gem .....	82
3194	Wm. L. Black, Hammonton.....	Premium Gem .....	75
3274	E. H. Berry, Toms River.....	Premium Gem .....	87
3004	R. W. Smith Co., Elmer.....	Long Island Mammoth .....	82
3196	A. S. Clark, Pitman.....	Long Island Mammoth .....	63
3199	C. W. Elkinton, Mullica Hill.....	Long Island Mammoth .....	36
3036	E. L. Ross, Cape May Court House..	Extra Early .....	90
3072	J. W. Briant, Salem.....	Extra Early .....	89
3191	C. W. Elkinton, Mullica Hill.....	Extra Early .....	79
3048	Serrata & Sons, Bridgeton.....	Alaska .....	96
3065	A. M. Niggin, Vineland.....	Alaska .....	95
3138	J. E. Blake Co., Pleasantville.....	Alaska .....	98
3185	Abbott & Co., May's Landing.....	Alaska .....	97
3207	S. A. Stewart, Woodbury.....	Alaska .....	98
3397	W. F. Howell, Newton.....	Alaska .....	88
3067	J. W. Briant, Salem.....	Alaska .....	88
3098	A. M. Niggin, Vineland.....	First and Best .....	99
3197	A. S. Clark & Son, Pitman.....	First and Best .....	69
3132	J. E. Blake & Co., Pleasantville.....	Potlatch .....	58
3136	J. E. Blake & Co., Pleasantville.....	American Wonder .....	87
3171	W. S. Shaw, Tuckahoe.....	American Wonder .....	83
3200	C. W. Elkinton, Mullica Hill.....	American Wonder .....	91
3144	J. E. Blake & Co., Pleasantville.....	Everbearing .....	83
3187	Wm. L. Black, Hammonton.....	Everbearing .....	58
3164	W. S. Shaw, Tuckahoe.....	Nott's Excelsior .....	79
3195	C. W. Elkinton, Mullica Hill.....	Nott's Excelsior .....	80
3414	W. F. Howell, Newton.....	Nott's Excelsior .....	95
3190	Wm. L. Black, Hammonton.....	Sutton's Excelsior .....	54
3247	Burlington Supply Co., Burlington...	Sutton's Excelsior .....	72
3203	Wm. L. Black, Hammonton.....	Champion of England .....	77
3206	C. W. Elkinton, Mullica Hill.....	Blackeye Marrowfat .....	91
3208	S. A. Stewart, Woodbury.....	Long Island Marrow .....	90

TABLE X  
ANALYSIS OF MISCELLANEOUS SEEDS

No.	Source of Sample	Varietal Name	Germination Per cent
RADISH			
3041	A. M. Niggin, Vineland.....	Early Scarlet Turnip .....	86.25
3165	Abbott & Co., May's Landing.....	Scarlet Turnip .....	88.50
TOMATO			
3185	Theo. Messinger, Egg Harbor.....	Stone .....	88.25
3305	E. H. Berry, Toms River.....	Acme .....	87.00
TURNIP			
3049	A. M. Niggin, Vineland.....	Rutabaga .....	97.00
3117	Abbott & Co., May's Landing.....	Rutabaga .....	72.20
3162	Theo. Messinger, Egg Harbor.....	Purple Top .....	60.20
CUCUMBER			
3040	A. M. Niggin, Vineland.....	Boston Prolific .....	69.50
3125	Abbott & Co., May's Landing.....	White Spine .....	97.50
3329	E. H. Berry, Toms River.....	Improved Tay Green .....	56.00
3475	Vineland Grain Co., Vineland.....	Jersey Pickling .....	23.50
CABBAGE			
3114	Abbott & Co., May's Landing.....	Late Flat Dutch .....	78.50
3115	Abbott & Co., May's Landing.....	Late Flat Dutch .....	69.75
3161	Theo. Messinger, Egg Harbor.....	Late Flat Dutch .....	55.70
3215	Abbott & Co., May's Landing.....	Early Winningstock .....	83.25

### ANALYSIS OF OFFICIAL SAMPLES—1916

Except for crimson clover the inspection work for the year ending October 31, 1916, was devoted to the securing of vegetable seeds offered in bulk lots by New Jersey dealers. The results of the laboratory tests of these samples are set forth in the following tables.

#### CRIMSON CLOVER SEED INVESTIGATIONS

The situation with respect to crimson clover seed in 1916 was such as to demand particular attention from the Seed Laboratory. Twenty-nine samples were collected and analyzed and the reports published early in June and previous to the time of general purchase. A study of the table giving results of germination tests will indicate the need of such action. These 29 samples represent 53,700 pounds of seed, sufficient to sow 2685 acres, if sown at the rate of 20 pounds per acre. The price ranges from \$6.00 to \$7.75 per bushel. The germination tests give 34 per cent as the lowest and 92.5 per cent as the highest. The following gives an idea of the quantity of the different grades of seed:

Germination 30 to 40%	8,040 lbs.
Germination 40 to 50%	9,240 lbs.
Germination 50 to 60%	13,380 lbs.
Germination 60 to 70%	3,960 lbs.
Germination 70 to 80%	6,780 lbs.
Germination 80 to 95%	7,635 lbs.

It is also apparent that no relation exists between quality and price. One lot priced at \$7.50 per bushel has a germination of 44 per cent and another priced at \$6.00 per bushel has a germination of 81.5 per cent.

While these samples do not represent all of the seed offered or sold to New Jersey farmers, yet the quantity examined seems sufficient to indicate the general quality. The results certainly indicate that purchase should be made with knowledge of germination in hand.

TABLE XI  
ANALYSIS OF CRIMSON CLOVER SEED

No.	Source of Sample	Germination, Per cent
3543	H. W. Doughten, Moorestown .....	47.20
3544	Burlington Supply Co., Burlington .....	72.50
3545	H. K. Shoemaker, Swedesboro .....	66.25
3546	S. Smedley, Glassboro .....	46.25
3547	South Jersey Farmers' Exchange, Woodstown .....	77.00
3548	Burlington County Farmers' Exchange, Mt. Holly .....	34.00
3549	Burlington County Farmers' Exchange, Mt. Holly .....	57.00
3550	South Jersey Farmers' Exchange, Mullica Hill .....	71.20
3551	M. F. Riley, Elmer .....	56.00
3552	M. F. Riley, Elmer .....	47.00
3553	Vineland Grain Co., Vineland .....	38.50
3554	E. E. Hires, Elmer .....	69.50
3555	Serrata & Sons, Bridgeton .....	54.00
3556	H. O. Newcomb, Bridgeton .....	44.00
3557	Farmers' Seed Store, Bridgeton .....	65.50
3558	Farmers' Seed Store, Bridgeton .....	55.00
3559	Anderson's Seed Store, Hammonton .....	63.50
3560	William Black, Hammonton .....	76.50
3561	E. H. Berry, Toms River .....	65.50
3562	W. N. Stewart, Englishtown .....	87.50
3563	J. J. du Bois, Jr., Freehold .....	83.50
3564	W. E. Mount Co., Englishtown .....	39.50
3565	J. E. Blake & Co., Pleasantville .....	65.00
3566	E. L. Ross, Cape May Court House .....	24.50
3567	Monmouth County Farmers' Exchange, Freehold .....	85.00
3568	R. Hance & Sons, Red Bank .....	74.00
3569	D. V. Perrine, Freehold .....	73.00
3570	Martin Ribsam, Trenton .....	83.50
3571	J. R. Wyckoff, Princeton Junction .....	92.50

TABLE XII  
ANALYSIS OF BEAN SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3609	R. Hance & Son, Red Bank.....	Refugee .....	95
3610	Burlington Supply Co., Burlington...	Refugee .....	98
3615	L. Sheard, Vineland.....	Round Pod Kidney Wax ....	95
3619	H. W. Shaw, Millville.....	White Kidney .....	86
3616	L. Sheard, Vineland.....	Bountiful .....	97
3617	A. M. Niggin, Vineland.....	Bountiful .....	92
3618	S. Pogust & Sons, Vineland.....	Howe's Champion .....	96
3620	S. Pogust & Sons, Vineland.....	Giant Stringless .....	84
3621	A. M. Niggin, Vineland.....	Burpee's Green Stringless ...	97
3622	H. W. Shaw, Millville.....	Burpee's Stringless .....	92
3623	J. W. Briant, Salem.....	Burpee's Stringless .....	98
3624	Price & Craft, Burlington.....	Burpee's Stringless .....	85
3611	Price & Craft, Burlington.....	Improved Golden Wax .....	99
3614	Burlington Supply Co., Burlington...	Golden-eye Wax .....	99
3679	L. Sheard, Vineland.....	Golden Wax .....	33
3680	J. K. Waddington & Sons, Salem...	Golden Wax .....	80
3681	R. Hance & Sons, Red Bank.....	Golden Wax .....	99
3682	E. L. Ross, Cape May Court House...	Golden Wax .....	100
3683	Abbott & Co., May's Landing.....	Golden Wax .....	98
3684	Vineland Grain Co., Vineland.....	Golden Wax .....	76
3025	A. M. Niggin, Vineland.....	Hodson Wax .....	98
3626	L. Sheard, Vineland.....	Hodson Wax .....	99
3627	H. W. Shaw, Millville.....	Hodson Wax .....	44
3628	Abbott & Co., May's Landing.....	Early Mohawk .....	78
3629	Price & Craft, Burlington.....	Weber Wax .....	96
3620	Minch Bros., Bridgeton.....	Longfellow .....	83
3631	Burlington Supply Co., Burlington...	Kentucky Wonder .....	100
3632	W. Shaw, Millville.....	Kentucky Wonder .....	89
3653	E. W. Elkinton, Mullica Hill.....	Valentine .....	94
3654	R. Hance & Sons, Red Bank.....	Black Valentine .....	96
3655	R. Hance & Sons, Red Bank.....	Improved Red Valentine ....	82
3657	Serrata & Sons, Bridgeton.....	Red Valentine .....	86
3660	S. A. Stewart, Woodbury.....	Red Valentine .....	100
3661	Abbott & Co., May's Landing.....	Red Valentine .....	75
3662	L. Sheard, Vineland.....	Red Valentine .....	88
3663	H. K. Shoemaker, Swedesboro.....	Red Valentine .....	100
3658	Minch Bros., Bridgeton.....	Hopkins Valentine .....	27
3659	E. L. Ross, Cape May Court House...	Valentine .....	99
3664	H. W. Shaw, Millville.....	Valentine .....	29
3672	S. Pogust & Son, Vineland.....	Dwarf Horticultural .....	96
3673	Minch Bros., Bridgeton.....	French Horticult'al Cranberry	97
3674	Minch Bros., Bridgeton.....	Dwarf Horticultural .....	97
3675	Serrata & Sons, Bridgeton.....	Dwarf Horticultural .....	94
3676	A. M. Niggin, Vineland.....	Dwarf Horticultural .....	94
3678	L. Sheard, Vineland.....	Dwarf Horticultural .....	87
3612	W. G. Champion, Millville.....	Old Homestead .....	100
3613	Serrata & Sons, Bridgeton.....	Goddard .....	89
3677	H. W. Shaw, Millville.....	Cranberry .....	92

TABLE XIII  
ANALYSIS OF LIMA BEAN SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3633	Burlington Supply Co., Burlington...	Leviathan Pole .....	74
3141	L. A. Stewart, Woodbury.....	Dreer's Pole .....	75
3641	E. L. Ross, Cape May Court House..	Giant Podded Pole .....	98
3640	H. W. Shaw, Millville.....	Shotwell's Improved .....	72
3639	S. Pogust & Sons, Vineland.....	Flat Dutch .....	96
3638	J. W. Briant, Salem.....	Holmes' Green Prolific .....	98
3634	S. A. Stewart, Woodbury.....	Large Jersey Whites .....	62
3644	H. K. Shoemaker, Swedesboro.....	Long Green Pod .....	100
3646	H. W. Shaw, Millville.....	Dreer's Improved .....	76
3647	Burlington Supply Co., Burlington...	Dreer's Improved Pole .....	100
3652	Serrata & Sons, Bridgeton.....	Burpee's Improved .....	88
3667	H. W. Shaw, Millville.....	King of the Garden .....	92
3668	Abbott & Co., May's Landing.....	King of the Garden .....	94
3670	Minch Bros., Bridgeton.....	King of the Garden .....	68
3671	Minch Bros., Bridgeton.....	King of the Garden .....	84
3665	R. Hance & Son, Red Bank.....	King of the Garden .....	80
3666	E. L. Ross, Cape May Court House..	King of the Garden .....	92
3669	Serrata & Sons, Bridgeton.....	King of the Garden .....	90
3643	Minch Bros., Bridgeton.....	Challenger .....	98
3645	Minch Bros., Bridgeton.....	Ford's Mammoth .....	92
3635	J. W. Briant, Salem.....	Dreer's Bush .....	98
3648	Minch Bros., Bridgeton.....	Burpee's Improved Bush .....	96
3636	R. Hance & Sons, Red Bank.....	Burpee's Bush .....	100
3649	L. Sheard, Vineland.....	Burpee's Bush .....	100
3650	H. W. Shaw, Millville.....	Burpee's Bush .....	96
3151	E. L. Ross, Cape May Court House..	Burpee's Bush .....	88
3685	Minch Bros., Bridgeton.....	Fordhook .....	98
3637	R. Hance & Sons, Red Bank.....	Fordhook Bush .....	98
3686	Serrata & Sons, Bridgeton.....	Fordhook Bush .....	96
3687	Abbott & Co., May's Landing.....	Fordhook Bush .....	98
3688	A. M. Niggin, Vineland.....	Fordhook Bush .....	98
3689	S. A. Stewart, Woodbury.....	Fordhook Bush .....	98
3690	W. G. Champion, Millville.....	Fordhook Bush .....	92
3691	Vineland Grain Co., Vineland.....	Fordhook Bush .....	96
3692	S. W. Elkinton, Mullica Hill.....	Fordhook Bush .....	100
3693	S. Pogust & Sons, Vineland.....	Fordhook Bush .....	90
3694	L. Sheard, Vineland.....	Fordhook Bush .....	88
3695	H. K. Shoemaker, Swedesboro.....	Fordhook Bush .....	92
3696	J. W. Briant, Salem .....	Burpee Fordhook .....	98
3697	Burlington Supply Co., Burlington...	Fordhook .....	98
3698	H. H. Shaw, Millville.....	Fordhook Bush .....	84
3699	E. L. Ross & Sons, Cape May Ct. H'se	Fordhook Bush .....	96

TABLE XIV  
ANALYSIS OF SWEET CORN SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3434	W. G. Champion, Millville.....	Stowell's Evergreen .....	96
3435	H. K. Shoemaker, Swedesboro.....	Stowell's Evergreen .....	89
3436	Vineland Grain Co., Vineland.....	Stowell's Evergreen .....	72
3437	J. W. Briant, Salem.....	Stowell's Evergreen .....	76
3438	Robt. Hance & Sons, Red Bank.....	Stowell's Evergreen .....	78
3439	Serrata & Sons, Bridgeton.....	Stowell's Evergreen .....	84
3440	Minch Bros., Bridgeton.....	Stowell's Evergreen .....	79
3441	L. Sheard, Vineland.....	Stowell's Evergreen .....	87
3442	C. A. Voelker, Glassboro.....	Stowell's Evergreen .....	82
3443	E. L. Ross, Cape May Court House..	Stowell's Evergreen .....	90
3444	Abbott & Co., May's Landing.....	Stowell's Evergreen .....	89
3445	E. W. Elkinton, Mullica Hill.....	Stowell's Evergreen .....	74
3446	A. M. Niggin, Vineland.....	Stowell's Evergreen .....	84
3460	Burlington Supply Co., Burlington..	Kindel's Early Giant .....	92
3461	H. K. Shoemaker, Swedesboro.....	Evergreen Extra Early .....	85
3462	Minch Bros., Bridgeton.....	Evergreen Extra Early .....	77
3463	W. G. Champion, Millville.....	Howling Mob .....	89
3464	Abbott & Co., May's Landing.....	Early Evergreen .....	54
3465	Burlington Supply Co., Burlington..	Champion .....	77
3466	Minch Bros., Bridgeton.....	Country Gentleman .....	68
3467	Abbott & Co., May's Landing.....	Country Gentleman .....	89
3468	E. W. Elkinton, Mullica Hill.....	Country Gentleman .....	75
3469	Burlington Supply Co., Burlington..	Country Gentleman .....	90
3447	E. W. Elkinton, Mullica Hill.....	Early Mammoth .....	94
3448	R. Hance & Sons, Red Bank.....	Early Mammoth .....	69
3449	J. W. Briant, Salem .....	Early Mammoth .....	83
3450	E. L. Ross, Cape May Court House..	Burpee's Fordhook Early .....	80
3451	Serrata & Sons, Bridgeton.....	Adam's Early .....	94
3452	J. K. Waddington & Sons, Salem....	Evergreen .....	93
3453	S. A. Stewart, Woodbury.....	Shoe Peg .....	83
3454	E. W. Elkinton, Mullica Hill.....	Shoe Peg .....	78
3455	Minch Bros., Bridgeton.....	Late Mammoth .....	85
3456	Minch Bros., Bridgeton.....	Golden Bantam .....	82
3457	Serrata & Sons, Bridgeton.....	Golden Bantam .....	86
3458	C. A. Voelker, Glassboro.....	Holmes' Premo .....	94
3459	Burlington Supply Co., Burlington...	Evergreen Zig-Zag .....	

TABLE XV  
ANALYSIS OF BEET SEED

No.	Source of Sample	Varietal Name	No. Sprouts per 100 Seed Balls
3492	J. W. Briant, Salem.....	Crosby's Egyptian .....	102
3499	H. W. Shaw, Millville.....	Extra Early Egyptian .....	144
3500	W. G. Champion, Millville.....	Early Egyptian .....	134
3491	H. K. Shoemaker, Swedesboro.....	Detroit Dark Turnip .....	205
3496	S. Pogust & Sons, Vineland.....	Detroit Dark Red .....	66
3497	J. W. Briant, Salem.....	Detroit Dark Red .....	153
3498	Serrata & Sons, Bridgeton.....	Detroit Early Blood Turnip..	126
3494	J. W. Briant, Salem.....	Eclipse .....	121
3495	Vineland Grain Co., Vineland.....	Eclipse .....	127
3493	Vineland Grain Co., Vineland.....	Long Blood .....	25

TABLE XVI  
ANALYSIS OF PEA SEED

No.	Source of Sample	Varietal Name	Germination Per cent
3576	W. G. Champion, Millville.....	Long Island Mammoth .....	94
3577	H. W. Shaw, Millville.....	Long Island Mammoth .....	58
3578	Minch Bros., Bridgeton.....	Long Island Mammoth .....	93
3519	S. A. Stewart, Woodbury.....	Large Mammoth .....	99
3520	W. Sheard, Vineland.....	White Eye Marrowfats .....	98
3521	J. W. Briant, Salem.....	Sutton Excelsior .....	96
3522	H. W. Shaw, Millville.....	Morning Star .....	88
3523	H. W. Shaw, Millville.....	Claudit .....	96
3524	Vineland Grain Co., Vineland.....	Taylor's Extra Early .....	88
3701	E. W. Elkinton, Mullica Hill.....	Extra Early .....	95
3725	J. K. Waddington & Sons, Salem.....	Philadelphia Extra Early.....	94
3726	H. W. Shaw, Millville.....	Philadelphia Extra Early.....	96
3727	C. A. Voelker, Glassboro.....	Philadelphia Extra Early.....	94
3525	J. K. Waddington, Salem.....	Everbearing .....	94
3704	Abbott & Co., May's Landing.....	Bliss Everbearing .....	78
3526	J. W. Briant, Salem.....	Alderman .....	99
3527	R. Hance & Son, Red Bank.....	Potlatch .....	89
3528	J. W. Briant, Salem.....	Potlatch .....	88
3589	R. Hance & Sons, Red Bank.....	First and Best .....	74
3607	J. W. Briant, Salem.....	Gradus .....	97
3702	R. Hance & Son, Red Bank.....	Abundance .....	97
3703	E. L. Ross, Cape May Court House..	Bliss Abundance .....	97
3708	Burlington Supply Co., Burlington...	Ameer .....	87
3709	H. W. Shaw, Millville.....	Ameer .....	97
3710	Minch Bros., Bridgeton.....	Ameer .....	91
3718	L. Sheard, Vineland.....	American Wonder .....	93
3719	E. L. Ross, Cape May Court House..	American Wonder .....	92
3720	S. A. Stewart, Woodbury.....	American Wonder .....	93
3721	R. Hance & Sons, Red Bank.....	Little Gems .....	85
3722	J. K. Waddington, Salem.....	Little Gems .....	85
3723	S. Pogust & Sons, Vineland.....	Little Gems .....	81
3724	Abbott & Co., May's Landing.....	McLean's Little Gem .....	88
3572	A. M. Niggin, Vineland.....	Thomas Laxton .....	93
3573	L. Sheard, Vineland.....	Thomas Laxton .....	92
3574	Burlington Supply Co., Burlington...	Thomas Laxton .....	98
3575	Vineland Grain Co., Vineland.....	Thomas Laxton .....	86
3705	W. G. Champion, Millville.....	Thomas Laxton .....	98
3706	L. Sheard, Vineland .....	Thomas Laxton .....	99
3707	Minch Bros., Bridgeton.....	Thomas Laxton .....	84
3728	J. W. Briant, Salem.....	Thomas Laxton .....	99
3700	J. W. Briant, Salem.....	Buists Improved Telephone..	97
3711	W. G. Champion, Millville.....	Telephone .....	85
3712	S. Pogust & Sons, Vineland.....	Telephone .....	92
3713	C. A. Voelker, Glassboro.....	Telephone .....	99
3714	H. K. Shoemaker, Swedesboro.....	Telephone .....	96
3715	A. M. Niggin, Vineland.....	Telephone .....	73
3716	J. W. Anderson, Millville.....	Telephone .....	70
3717	L. Sheard, Vineland.....	Telephone .....	82
3518	Abbott & Co., May's Landing.....	Early Alaska .....	100
3579	Serrata & Sons, Bridgeton.....	Alaska .....	99
3580	Abbott & Sons, May's Landing.....	Alaska .....	95
3581	Minch Bros., Bridgeton.....	Alaska .....	98

TABLE XVI—Continued

No.	Source of Sample	Varietal Name	Germination Per cent
3582	E. W. Elkinton, Mullica Hill.....	Alaska .....	94
3583	Burlington Supply Co., Burlington...	Alaska .....	99
3584	S. A. Stewart, Woodbury.....	Alaska .....	94
3585	S. Pogust & Son, Vineland.....	Alaska .....	97
3586	Vineland Grain Co., Vineland .....	Alaska .....	86
3587	J. W. Briant, Salem.....	Alaska .....	96
3588	W. G. Champion, Millville.....	Alaska .....	100
3529	W. G. Wells, Millville.....	Dwarf Champion of England.	90
3530	A. M. Niggin, Vineland.....	Champion .....	85
3531	L. Sheard, Vineland.....	Champion of England .....	94
3532	E. L. Ross, Cape May Court House..	Extra Early .....	76
3533	S. A. Stewart, Woodbury .....	Sutton Excelsior .....	45
3534	H. W. Shaw, Millville.....	Improved Stratagem .....	32
3535	W. G. Champion, Millville.....	Prince Edward .....	77
3536	Burlington Supply Co., Burlington...	Prince Edward .....	90
3537	H. K. Shoemaker, Swedesboro .....	Premium Gem .....	87
3538	J. W. Briant, Salem.....	Premium Gem .....	57
3539	H. W. Shaw, Millville.....	Premium Gem .....	91
3540	J. K. Waddington & Sons, Salem....	Improved Marrofats .....	96
3541	E. W. Elkinton, Mullica Hill.....	Black Eyed Marrowfats .....	78
3590	Minch Bros., Bridgeton.....	First and Best .....	98
3591	H. W. Shaw, Millville.....	First and Best .....	65
3592	Burlington Supply Co., Burlington...	First and Best .....	90
3593	S. A. Stewart, Woodbury .....	First and Best .....	87.5
3594	J. W. Briant, Salem.....	First and Best .....	88
3595	A. M. Niggin, Vineland.....	First and Best .....	99
3596	W. G. Champion, Millville.....	First and Best .....	93
3597	A. M. Niggin, Vineland.....	Gradus .....	94
3598	Serrata & Sons, Bridgeton.....	Gradus .....	76
3599	C. A. Voelker, Glassboro.....	Gradus .....	92
3600	Minch Bros., Bridgeton.....	Gradus .....	79
3601	S. A. Stewart, Woodbury.....	Gradus .....	96
3602	S. Pogust, Vineland.....	Gradus .....	94
3603	H. W. Shaw, Millville.....	Gradus .....	96
3606	Vineland Grain Co., Vineland.....	Gradus .....	88
3605	J. W. Anderson, Millville.....	Gradus .....	84
3606	H. K. Shoemaker, Swedesboro.....	Gradus .....	51
3608	L. Sheard, Vineland.....	Gradus .....	84

TABLE XVII  
ANALYSIS OF MISCELLANEOUS SEEDS

No.	Source of Sample	Varietal Name	Germination Per cent
<b>CABBAGE</b>			
3501	Vineland Grain Co., Vineland.....	Late Flat Dutch .....	71.0
3502	Vineland Grain Co., Vineland.....	Early Flat Dutch .....	34.0
3503	Vineland Grain Co., Vineland.....	Early Stonehead .....	67.5
<b>CARROT</b>			
3489	H. W. Shaw, Millville.....	Danvers Half-Long .....	25.5
3490	Vineland Grain Co., Vineland.....	Danvers Half-Long .....	35.5
<b>LETTUCE</b>			
3517	H. W. Shaw, Millville.....	Early Sillsian .....	75.0
3512	H. K. Shoemaker, Swedesboro.....	Early Pear Sillsian .....	67.5
3516	H. W. Shaw, Millville.....	Big Boston .....	46.0
3515	Vineland Grain Co., Vineland.....	Sure Head .....	88.5
3514	Vineland Grain Co., Vineland.....	Prize Head .....	86.0
<b>CUCUMBER</b>			
3476	Vineland Grain Co., Vineland.....	White Spine .....	79.0
3478	H. K. Shoemaker, Swedesboro.....	Arlington White Spine .....	99.0
3477	H. W. Shaw, Millville.....	White Spine .....	56.5
<b>KALE</b>			
3479	Vineland Grain Co., Vineland.....	Dwarf Green Curled .....	74.5
<b>MUSKMELON</b>			
3504	Vineland Grain Co., Vineland.....	Rocky Ford .....	96.0
3505	H. W. Shaw, Millville.....	Fordhook .....	97.5
<b>ONION</b>			
3510	Vineland Grain Co., Vineland.....	White Portugal .....	49.5
3511	Vineland Grain Co., Vineland.....	Large Red Weatherfield .....	12.0
3513	Vineland Grain Co., Vineland.....	Prizetaker .....	26.5
<b>PARSNIP</b>			
3509	Vineland Grain Co., Vineland.....	Hollow Crown .....	42.5
<b>PEPPER</b>			
3480	Vineland Grain Co., Vineland.....	Ruby King .....	88.5
3481	Vineland Grain Co., Vineland.....	Bull Nose .....	65.5
<b>RADISH</b>			
3470	H. W. Shaw, Millville.....	Icicle .....	76.0
3471	H. W. Shaw, Millville.....	Long Scarlet .....	82.0
3472	Vineland Grain Co., Vineland.....	Early White Turnip .....	42.0
3573	Vineland Grain Co., Vineland.....	Early Long Scarlet .....	85.5
3474	H. W. Shaw, Millville.....	Turnip .....	60.5
<b>SPINACH</b>			
3482	Vineland Grain Co., Vineland.....	Long Standing .....	40.5
<b>TOMATO</b>			
3483	Vineland Grain Co., Vineland.....	Stone .....	68.0
3484	H. W. Shaw, Millville.....	Matchless .....	86.5
3485	Vineland Grain Co., Vineland.....	Acme .....	69.5
3486	H. W. Shaw, Millville.....	Red Rocks .....	81.5
<b>TURNIP</b>			
3487	H. W. Shaw, Millville.....	.....	56.0
3488	Vineland Grain Co., Vineland.....	Purple Flat Top .....	89.5

## THE NEW SEED LAW

The law which has provided the funds for the Seed Laboratory during the past four years has been superceded by a law generally known as a label law, in that its main feature is the requirement of certain labels on packages of seeds indicating the quality of seed contained therein. The full text of this law is given in Circular 59 of the New Jersey Agricultural Experiment Station, which is available upon request. The new law also provides for free test, examination and analysis of seed for residents of the state. In spite of the new law, individuals should use the same precaution in the selection and purchase of agricultural seeds as heretofore advised. It is well to be certain as to what the statements on the label actually mean, and to understand just how far they can be used in judging of quality. Appearance, vigor of sprouts, and trueness of variety or strain are factors which greatly affect or indicate quality, results and profits.

## USE THE SEED LABORATORY

The greater part of the seeds represented by the samples listed in the foregoing tables will have been sown before this bulletin reaches the reader. What value therefore can such a publication have to those who have bought and sown these or other seeds not tested by the Seed Laboratory? To attempt an answer to this is to state such general conclusions as may be drawn from the foregoing reports of analyses.

It is difficult to measure the value of an agency which is studying the quality of seed offered for sale in the state and which is authorized to publish its findings. It is not possible to know how many are influenced by the possibilities of publication. This feature is a most potent factor in the Federal investigations of adulterated seed. On the other hand, publicity also serves as a desirable advertising feature to the man who is giving quality.

To the buyer these tables of analyses furnish proof of many instances where the quality of the seeds was such that purchase would be doubtful were the facts presented with the seeds. To be in a position to know these facts about quality is the argument for buying seeds by samples and analysis. Such analysis gives one certain information for protection and guidance. Some dealers will voluntarily give such facts to their customers. They are required to do so in some states.

It is evident that the Seed Laboratory acting alone as an investigating agent can exert considerable influence but cannot be most effective unless it is called into service by the individual farmer or by association of farmers at the time when they are engaged in the business of buying seed for the season's crop. Further, the Seed Laboratory can be of the greatest value in determining the quality of seed before it is purchased and not after it has been sown and found by test to be unfit for seeding purposes. Granted that the Seed Laboratory should be used for the purposes indicated, directions are given in the following paragraphs for its most effective use.

## HOW TO USE THE SEED LABORATORY

### THE SAMPLE

Of prime importance is the sample submitted for a test of any sort. If it is not a fair representation of the entire lot, then the value of the analysis is decreased or lost entirely. It is necessary, then, that the sample be taken in a proper manner, to insure that the results of analysis will be of value and applicable to the entire lot of seed.

If samples of prospective purchase are secured from dealers, they should be submitted to the laboratory unchanged in amount, for, as a rule, they are none too large. The samples are preserved under proper conditions in the Seed Laboratory so that they are always available for future reference, but will be returned to the sender after analysis is made, if desired.

If the seed has already been purchased and delivered, then there are two questions concerning the sample: how shall it be taken, and how much is it necessary to send to the Seed Laboratory.

### HOW TO TAKE THE SAMPLE

Small lots of seeds up to three or four bushels should be emptied upon a smooth surface and thoroughly mixed so that the different elements will be equally distributed. Small portions are then selected from different points in the pile to make up the sample for testing.

If larger quantities in sacks are to be sampled, some form of sampler is practically necessary. This is used to secure small samples from the top, middle and bottom of each sack. The small samples should be thoroughly mixed together and then a sample for analysis selected by taking small portions from different parts of

this mixture. In any case the desired result is to get a sample that will be truly representative of the seed and which cannot be obtained by taking the sample from one place without previous mixing of the seed, because of the tendency of the seed in packages to separate into certain levels according to the amount of shaking or jarring they are subjected to in transportation.

#### THE SIZE OF THE SAMPLE

Too often the sample received is so small that a test is practically impossible and even if made, the results are of little value. It is urged that the samples sent to the Seed Laboratory approximate the following weights whenever possible.

	Oz.
Red top, timothy, and all small seeds .....	1
Smaller vegetable seeds, such as lettuce, onion, radish, and turnips .....	1
Clovers, alfalfas and sorghums .....	2
Larger grass seeds, such as rye grass, brome grass, orchard grass and millets .....	2
Larger vegetable seeds, except corn, peas and beans.....	2
Cereals, vetches, cowpeas, corn, peas, beans, and all large seeds not provided for .....	4

#### SENDING THE SAMPLES

Too, often the samples as received at the Seed Laboratory are in an undesirable condition due to lack of proper attention in preparing for shipment. Sometimes when two or more samples are sent together, the greater part of the separate samples will be found mixed together in the box or envelope in which they were sent. All containers should be properly sealed so that this mixing cannot occur. Small boxes or strong manila envelopes should be used. The ordinary light envelop used for correspondence does not usually seal tight enough to prevent leakage and should not be used where several samples are sent together unless the precaution is taken to paste the entire flap down with some adhesive material as paste or mucilage.

When the samples are finally prepared for shipment, they should be plainly addressed to the Seed Laboratory of the New Jersey Agricultural Experiment Stations, New Brunswick, N. J. The package should also have some distinctive mark of the sender so that it can be indentified and properly recorded when received. To complete the laboratory records of the samples, it is desired that the following information accompany the samples of seed.

Name and address of sender .....  
 Name and address of dealer .....  
 Trade name of seed .....  
 Where grown .....  
 Price per bu.....per lb.....  
 Kind of test desired .....  
 State guarantee, if any .....  
 Other remarks .....

This information is not used for publication nor as a basis for action against any person or firms mentioned. It is desirable to have these facts that those in charge of the Seed Laboratory may extend their knowledge of seed trade conditions in the state. Supplying this information is only a small return for the service rendered and will materially help to solve the problems concerned.

### THE WORK OF THE SEED LABORATORY

The Seed Laboratory is prepared to undertake the following work for applicants:

1. Identification of crop seeds and weed seeds.
2. Identification of weed plants.
3. Purity test for all agricultural seeds.
4. Germination test for all agricultural seeds.
5. Sulfur test for oats and other grains which may be suspected of having been subjected to the process known as sulfuring.
6. To supply any other information concerning seeds and weeds that can possibly be given.

### REPORTS

Samples of seeds are promptly filed and receive attention in the order in which they are received. As a general rule, with the present facilities and the present demand for service, reports of purity tests can be returned within two days after receiving the sample. The germination test requires a longer period, depending on the variety of seed. For most seeds, however, the time limit is from a week to ten days. Some of the grasses require from three to four weeks' time before a full report can be given.

The reports are made on special blank forms and include the information necessary to judge the quality of seed with respect to purity or germination or both, where requested.

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NOTE.—The seed analyst cannot tell from the appearance of seeds whether or not they are true to varietal name. This can be determined only by planting the seed and examining the crop therefrom.



ANALYSES OF COMMERCIAL FERTILIZERS AND  
GROUND BONE;  
ANALYSES OF AGRICULTURAL LIME

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NEW JERSEY

AGRICULTURAL

**Experiment Stations**

BULLETIN 303

New Brunswick, N. J.

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# NEW JERSEY

## AGRICULTURAL EXPERIMENT STATIONS

BULLETIN 303

December 12, 1916

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ANALYSES OF COMMERCIAL FERTILIZERS AND  
GROUND BONE;

ANALYSES OF AGRICULTURAL LIME

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By

CHARLES S. CATHCART, *State Chemist\**

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A portion of the results obtained during the inspection for 1916 was published in Bulletin 297 and the remaining analyses, together with a discussion of the whole inspection, are herewith presented.

### AUTHORITY FOR MAKING THE INSPECTION

The inspection of the fertilizers sold in the state was made in accordance with the law entitled "An Act Concerning Fertilizers" which was approved March 27, 1912. The principal objects of this law are: (1) the protection of the purchaser, and (2) the protection of the honest manufacturer. This protection is secured by the several requirements as enumerated in the law which, briefly stated, consists of the following:

1. The filing of a sworn statement is required showing the minimum percentage of each element of plant-food to be guaranteed and, also, that the guarantee given will be attached to each package of the material offered for sale. The form to be used is prescribed and no additional statements are permitted. No claim or guarantee can be made for less than 0.82 per cent of nitrogen, equivalent to 1 per cent of ammonia; or for less than 1 per cent of phosphoric acid, or

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\* The analyses were made by Ralph L. Willis, Frank O. Fitts, Louis J. Kleinfeld, D. James Kay and Archie C. Wark.

for less than 1 per cent of potash. The word "bone" cannot be used in connection with a brand name unless the phosphoric acid contained shall be derived from pure animal bone. As an additional protection the law also states that "a brand name of a mixed fertilizer once registered, shall not be changed to a lower grade at any subsequent registration."

2. Tonnage reports are required to be rendered and an inspection fee paid for each ton sold at the rate of 15 cents per ton.

3. The state chemist, or his deputy, is given the power to collect samples of fertilizers, to make the analyses and to publish the results.

4. The penalty for a violation of any of the requirements is given.

## REGISTRATIONS

Annual registrations are required to be submitted on November first, but a manufacturer is permitted to register a new brand at any time during the year, provided that this requirement is complied with before the material is actually placed on the market. Judging from the information received during the inspections, it is quite evident that some of the manufacturers do not at all times consider the question of registration to be very important, and as a result it is either overlooked until their attention has been called to the omission, or it is entrusted to some one who does not make the record which will exactly correspond to the statements that are attached to the materials as sold. In order that a registration may cover a given brand, it is absolutely necessary that the statements as registered (and this includes the brand names as well as the guarantees) must correspond with the statements attached to the materials. If the two statements do not agree in every particular, it must be considered that the brand in question has not been registered as required.

The whole question of registration, since it is one of the requirements of the law, is important, and each manufacturer or person responsible for a fertilizer on our markets should make arrangements so that the registrations may not only be made at the time specified but, also, when they are made that the information given is accurate.

During the year, 131 firms or persons registered 1493 brands, 111 of which were not registered, however, until the brands had been located by our inspectors. The unregistered brands that were collected represented the products of 42 manufacturers and consisted

of 115 different brands. The following manufacturers failed to make the necessary registrations for the remaining four brands:

E. M. Carman, Englewood, N. J.

L. H. Chambers, Mt. Holly, N. J.

Vaughan Seed Store, Chicago, Ill.

W. Wilde, Vineland, N. J.

The registrations received up to January 18, 1916, were published in Bulletin 290. The registrations received since that date are published as a part of this report.

Inasmuch as the law prescribes the form of guarantee to be attached to the materials sold, it is necessary, before a brand is registered, to insist that the application blank should show all the guarantees required, and it is expected to find the registered guarantees attached to the materials. A few applications have been received which did not give all of the guarantees required, but the corrected applications were complete and with a very few exceptions the full information was attached to the material. The condition has been taken up with the parties concerned and there should be no reason for their future shipments not being correctly guaranteed.

It is admitted that under normal conditions the manufacturers have many problems to solve in order to comply with the laws of the various states, and during the past year they undoubtedly have experienced additional difficulties which were caused by the scarcity of some of the materials used in preparing the brands. On account of one of the requirements of the law of this state, when a manufacturer could not supply the full guarantee previously given for any brand, it was necessary to adopt a new brand name for the mixture. The scarcity of the potash compounds, therefore, compelled the manufacturers to prepare many new mixtures, and under the conditions one would have expected to find many of the standard brands with the guarantees lowered. This condition, however, did not exist since all of the manufacturers, with but a single exception, branded their materials in accordance with the requirements, and the attitude which they have taken reflects great credit upon their business methods.

The one case of incorrect branding which was referred to could have been avoided if the company responsible for the condition, Taylor Provision Co., Trenton, N. J., had applied for registration at the required time. This was not done, however, and the question

was not taken up by them until after the materials had been sold and sampled by our inspector. A full explanation was given, but since the entire output had been sold an adequate adjustment was difficult. It was finally agreed that each purchaser should be made to understand clearly that an error had been made in the branding, and that in the future the registration would be made at the proper time.

### REPORTS OF TONNAGE

In accordance with the law and also with the certified statements made at the time of registering the brands to be offered for sale, reports on the tonnage sold are required to be rendered on April first and November first of each year. We have had no reason to question any of the reports that have been rendered with the exception of the April report of this year which was submitted by the Standard Guano Co., Baltimore, Md. This report was very much smaller than their known sales and it is supposed that an error was made when the report was prepared; but it was impossible to secure from the company any information regarding the discrepancy. After waiting a suitable time the party purchasing the materials from this company paid the required inspection fee.

The following is a summary of the reports received during the past four years:

Year	April Reports		November Reports		Total for the Year Tons
	Mixed Fertilizers Tons	Fertilizer Materials Tons	Mixed Fertilizers Tons	Fertilizer Materials Tons	
1913	87,446.91	10,303.17	51,706.28	7,204.79	156,661.15
1914	78,768.27	8,735.62	59,223.26	8,686.99	155,414.14
1915	87,052.13	7,276.45	53,288.11	5,459.28	153,075.97
1916	61,368.88	9,032.38	52,328.81	7,069.70	129,800.07

### RULES AND REGULATIONS

The law provides that the state chemist shall have authority to establish rules and regulations in regard to the inspection, analyses and sale of fertilizers. In accordance with this provision the following rulings have been made:

1. Two reports are required annually, and the dates fixed by the law are April first and November first. The April report covers the sales from November first to April first, and the November report covers the sales from April first to November first.

2. Whenever a corporation, firm or person shall have filed a statement required by Section 2 of the law and shall have paid the inspection fee as required by Section 4 of the law, no other agent, importer, corporation, firm or person shall be required to pay the inspection fee upon such brands.

3. All corporations, firms or persons who have registered the regular brands manufactured by them and, also, the fertilizer materials offered for sale by them, can furnish mixtures, commonly known as "special mixtures" or "special compounds," which are prepared for immediate delivery and in accordance with a formula submitted by the purchaser, without having the mixture registered before filling the order, provided the following procedure is adopted:

(a) A certified statement is to be filed with the state chemist that it is desired to make "special mixtures" for immediate delivery in accordance with formula submitted by the purchaser, and that the tonnage of material used will be accounted for in the reports that are required to be rendered.

(b) The shipments of these "special mixtures" during the fiscal year are to be numbered consecutively, a record being made so that the formula with the guaranteed analysis of each ingredient used or the calculated guarantee of the mixture can be furnished the state chemist when he so requests.

(c) The shipments are to be in plain bags with tags attached, giving the following information:

SPECIAL MIXTURE No. (5).

Mixture of Registered Ingredients Prepared for

(John Jones, Salem, N. J.)

Manufactured by (Smith Fertilizer Co., Camden, N. J.)

4. Reports on samples which are found to satisfy substantially the guarantees will be marked "Official," and are submitted to the consumer on the same date as to the manufacturer. When analyses show samples to be deficient, reports are submitted to manufacturers and objections to the report or requests for a portion of duplicate sample must be made within 10 days from the date of report in order to receive consideration. Should a manufacturer's report on the official sample differ from our report, every effort will be made to locate the cause, but only those results that can be duplicated in this laboratory by the use of the methods adopted by the Association of Official Agricultural Chemists will be accepted as official.

## THE TRADE VALUES OF THE ESSENTIAL ELEMENTS OF PLANT-FOOD

It has been the practice for the Station to prepare each year a schedule of trade-values which were determined by the use of the wholesale quotations as published weekly in the *Oil, Paint & Drug Reporter* and the retail quotations which have been received by consumers. A tabulation of the various quotations was prepared this year and the great fluctuation in the prices noted. Several of the larger manufacturers were then requested to give us confidentially the prices which they would ask for their materials. The result of a careful study of the different quotations was that if a schedule of trade-values were made by the method in use during the past years, the calculated valuations of mixed goods would exceed the prices asked by the manufacturers. It is evident that such valuations would not give the information desired and, consequently, under the conditions it would not be fair to either manufacturer or consumer to use such a schedule. Although this was the conclusion from the information at hand, a final decision was deferred until additional information had been obtained.

In the early part of March the annual conference of the directors and chemists of the experiment stations of the New England states and New Jersey was held. The question of valuations was very thoroughly discussed, and it was the unanimous opinion of those present that, on account of the great fluctuations in the prices of the various materials used, no schedule could be prepared which would fairly represent the charges to be made during the season.

On account of this condition no schedule of trade-values has been prepared for this year and no valuations have been computed either for fertilizer materials or for mixed fertilizers.

## THE POTASH SITUATION

Many inquiries have been received regarding the nature and value of the potash products that are being prepared in the West from the lakes and from alunite. We have not had opportunity to make complete analyses of these products, but from the information received from other sources, a unit of water-soluble potash in these materials has the same commercial and agricultural value as a unit of the same element in the German salts. Since the amount of potash that is available from these sources is comparatively limited and, also, since there is no prospect at this time to receive any considerable

quantity from other sources, every effort should be made to conserve the materials which contain potash.

### INSPECTION FOR 1916

The inspection for the present year was made by two inspectors who have been engaged in this particular kind of work for several years. Every county in the state was visited and a total of 1640 samples was received at the Station, all but a small percentage of which being collected by the official inspectors. As usual, the samples forwarded by individuals, other than the inspectors, were analyzed and reported to the parties sending the same; but the results obtained with any of the samples of mixed materials are not included in the tabulations.

The samples received represented the stock of 561 dealers and consumers who were located in 230 cities or towns.

#### THE SELECTION OF SAMPLES FOR EXAMINATION

The samples secured by our official samplers generally include many duplicates and sometimes a larger multiple of the various brands. In making the selection of the sample to be taken for analysis, when more than one sample of the brand has been received, it is our practice to select the one that represented the largest stock on hand at the time of sampling and, also, when possible to select the samples of the different brands, of any one firm, which were taken at different localities. It frequently happens, however, that but one sample of the brand has been received, and in such cases there is no opportunity to make a selection. When a duplicate sample is analyzed, the sample taken represents the stock of another dealer, or a sample is secured which represents a different shipment.

Unofficial samples of materials that are sold carrying a guarantee are seldom analyzed unless there is a particular reason for doing so. Persons desiring analyses of any samples should notify the state chemist, giving the brand name, the name of the manufacturer and the number of tons on hand. Upon receipt of this information, if the brand has not been recently analyzed and the tonnage warrants it, arrangements will be made to send an inspector to secure the sample without expense to the person making the request.

There are two classes of unofficial samples, however, that will be examined, i. e., when the analysis might demonstrate a possible development of waste products into cheap sources of plant-food, or

might in other ways be of general interest. In either case sufficient information concerning the sample must be given in order that the analysis may be of service to the general public.

The samples analyzed consisted of the following:

- 565 samples of commercial fertilizers.
- 27 samples of commercial fertilizers (duplicates).
- 45 samples of commercial fertilizers (unofficial).
- 13 samples of home mixtures.
- 208 samples of fertilizer materials.
- 43 samples of ground bone.
- 117 samples of sundry materials.

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1018 samples total.

The analyses of the above samples required about 11,500 separate determinations.

#### THE CHEMICAL EXAMINATION

The chemical examinations of the various brands of fertilizers were made in accordance with the official methods, and consisted of determining the content of the following:

*Nitrogen.* Nitrates, ammonia salts, soluble organic, insoluble organic (active and inactive), and total nitrogen.

*Phosphoric Acid.* Water-soluble, ammonium-citrate-soluble, insoluble, total and available phosphoric acid.

*Potash.* Water-soluble potash and whether in form of muriate or sulphate.

The results of the above determinations with the exception of the percentages found for the "active insoluble" and the "inactive insoluble" organic nitrogen are given in the tabulations. During the past few years the tabulations contained the results of all of the determinations noted above. Statements have been made, however, that the various results as tabulated for the organic nitrogen are confusing and that the average consumer cannot, or at least does not, ascertain the activity of this constituent. A knowledge of the character or activity of the nitrogen derived from organic matter is very important, and it is desired that the information given in the bulletins should be stated in such a form that would clearly show the value of the material. In order to make the report as helpful as possible, the form of tabulating the results relating to the organic nitrogen

has been changed, and instead of tabulating the "water-soluble" and the "active insoluble and inactive insoluble organic" nitrogen, the results are reported under the two headings: "as soluble organic" and "as insoluble organic" nitrogen. All of the determinations were made, however, and duly reported to the manufacturers and to the purchaser whose goods were examined. In addition to the determinations reported as noted above, if, in the examination of the insoluble nitrogen, results were secured that indicated the constituent was derived from materials of an inferior grade, the percentage as reported is accompanied by an appropriate figure which refers to a note at the bottom of the page. This note gives a statement as to the character of the insoluble nitrogen and, also, the percentage of activity as found by the alkaline permanganate method. If the examination indicated that the constituent was derived from materials of at least the average activity, no additional statement is made. This method of tabulating shows at a glance those brands which contained a portion, at least, of the organic nitrogen in an inactive form.

#### GUARANTEED AND ACTUAL COMPOSITION

All of the samples, with one exception, were accompanied by guarantees at the time of shipment, although all of the guarantees were not stated in the form required by the fertilizer law.

The total number of brands of mixed fertilizers examined was 565, and of this number 289 did not carry any guarantee for potash.

The average analysis of the 276 brands guaranteed to contain nitrogen, phosphoric acid and potash and the average guarantees are as follows:

	Average %	Found %	Average Guaranteed %
Nitrogen, as nitrates .....	0.32		
Nitrogen, as ammonia salts .....	0.83		
Nitrogen, as water-soluble organic .....	0.42		
Nitrogen, as water-insoluble organic .....	0.82		
Nitrogen, total .....		2.39	2.48
Phosphoric acid, total .....	10.67		
Phosphoric acid, insoluble .....	1.69		
Phosphoric acid, available .....		8.98	8.37
Potash .....		1.39	1.40

The average analysis of the 289 brands guaranteed to contain nitrogen and phosphoric acid, and the average guarantees are as follows:

	Average %	Found %	Average Guaranteed %
Nitrogen, as nitrates .....	0.45		
Nitrogen, as ammonia salts .....	1.00		
Nitrogen, as water-soluble organic .....	0.51		
Nitrogen, as water-insoluble organic .....	1.15		
Nitrogen, total .....		3.11	3.18
Phosphoric acid, total .....	11.25		
Phosphoric acid, insoluble .....	2.01		
Phosphoric acid, available .....		9.24	8.94

In accordance with the preceding tabulations the brands, taken as a whole, substantially satisfied the guarantees given; but if the individual analyses are examined it will be noted that in some instances the guarantees were not delivered, while in other brands the guarantees were exceeded. A detailed study of the analyses will show that 122 brands satisfied every guarantee given, and in addition to this number 233 brands substantially satisfied the claims of the manufacturers. The remaining 209 brands were deficient. Of these deficient brands, 182 were deficient in one element, 26 in two elements, and one in all three of the guaranteed elements.

The record for this year shows that about 37 per cent of the brands were deficient. This is the largest percentage of deficient brands that has been reported since 1912.

The following tabulation will show the deficiencies found this year, as well as those reported during the past ten years. In preparing this tabulation, deficiencies of 0.20 per cent or less of nitrogen, and 0.30 per cent or less of phosphoric acid or potash have been disregarded.

Year	Number of Brands				Deficiencies possible	Actual Deficiencies			
	Examined	Found as guaranteed	Found deficient	Percentage deficient		Nitrogen	Phosphoric Acid	Potash	Percentage
1906	430	210	220	51	1,290	111	85	77	21.2
1907	438	223	215	49	1,314	92	114	58	20.1
1908	463	227	236	51	1,389	96	149	31	19.8
1909	483	280	203	42	1,449	71	137	36	16.8
1910	520	316	204	39	1,560	51	142	45	15.3
1911	514	341	173	34	1,542	36	115	42	12.5
1912	536	326	210	39	1,608	47	146	33	14.1
1913	623	457	166	28	1,869	74	86	36	10.5
1914	608	420	188	31	1,824	63	92	49	11.2
1915	543	367	176	32	1,629	94	83	31	12.8
1916	565	356	209	37	1,406	139	81	17	16.9

In the guaranteed brands examined there were 1406 deficiencies possible, and of this number 237 or 16.9 per cent were found. This is the largest percentage of deficiencies found since 1908. Various causes have been suggested by different manufacturers for this condition, but no statement has been given that would indicate that the purchaser was in any way responsible for the composition of the materials as delivered. The charges that were made for all of the shipments were undoubtedly based upon the cost of mixtures that should contain the full amount of plant-food guaranteed and, consequently, those who received brands that were deficient paid an excessive price for their fertilizers. In some cases the manufacturers have given a rebate sufficient to cover the deficiency, but undoubtedly a large sum of money has been paid by the purchasers for which no value has been received.

Since it is not the duty of the state chemist to enforce the law, it is expected that the purchasers will assist in protecting their own interests by insisting that they should receive an equivalent for their money. Every official sample that is examined is reported to the manufacturer responsible for the material and, also, to the purchaser of the stock examined. If the purchaser receives a report that is marked "deficient," the question of the value of the material should be taken up with the manufacturer, and it is quite probable that an adjustment will be made. If, however, no satisfactory adjustment is made and the conditions warrant it, the case should be reported to the prosecutor of the county in which the violation has occurred, since Section 7 of the law states that if a corporation, firm or person has sold fertilizer found by analysis, made by state chemist, not to contain substantially the guaranteed percentage of any one of the ingredients in the guaranteed analysis, such corporation, firm or person is guilty of a misdemeanor.

There were 139 deficiencies in the total nitrogen content of the brands examined, and this is the largest number of deficiencies of this element that has been reported since the inspection work started. This is a serious condition and should be met by prompt and effective measures.

In addition to securing the full amount of the nitrogen guaranteed, it is also important to know something of the character of the nitrogen delivered. The law requires the guarantee of total nitrogen to be stated, but as far as the guarantee goes it may be derived

wholly or in part from materials such as nitrate of soda, sulfate of ammonia, cyanamid, dried blood, fish, tankage, bone, garbage tankage, leather, peat, etc. The tabulations show the percentage of nitrogen which was determined as nitrate, as ammonia salts, as soluble and insoluble organic, and they also show those brands whose insoluble nitrogen was derived from inert forms. A study of these tables would undoubtedly give some information that could be made use of when purchasing fertilizers for future use.

Nitrogen in the form of nitrates was found in 201 brands, while 456 brands contained ammonia salts and 152 brands contained both of these available forms of nitrogen. All of the brands, with one exception, contained organic nitrogen, the value of which depending upon its source. In addition to determining the percentage of organic nitrogen, determinations were made to ascertain its activity or value for fertilizer purposes. These determinations gave evidence that the insoluble organic nitrogen in over 16 per cent of the brands was derived from low-grade materials.

There were 81 deficiencies in phosphoric acid, which is a slight improvement over last year.

About 35 per cent of the brands were guaranteed to contain 1 per cent of potash, about 10 per cent were guaranteed 2 per cent, and 4 per cent were guaranteed 3 per cent. Eighteen of the brands did not contain a sufficient amount of chlorine to combine with the potash present in order to form muriate of potash, and they have been marked in the tabulations as being derived from sulfate. There were 17 brands deficient in potash.

#### STATION'S VALUATION AND SELLING PRICE

It has been the practice at this Station to calculate the valuations of the brands analyzed, but for reasons given on a preceding page we were unable to make any valuations this year. On account of this condition we are unable to give the full information for the present year.

In order that a comparison of the brands of complete fertilizers containing nitrogen, phosphoric acid and potash may be made, the following tabulation is given which shows the average composition, Station's valuation and selling price of the brands of complete fertilizers examined during the past ten years, and the average analysis and selling price of the brands examined this year.

Year	Total Nitrogen	Total Phos. Acid	Available Phos. Acid	Insoluble Phos. Acid	Potash	Station's valuation	Selling price	Percentage difference	Actual difference
	%	%	%	%	%				%
1906 .....	2.37	10.04	7.87	2.17	5.67	\$21 28	\$28 12	\$6 84	32.1
1907 .....	2.30	9.77	7.45	2.32	5.86	22 35	28 31	5 96	26.7
1908 .....	2.34	9.64	7.36	2.28	6.24	22 74	29 04	6 30	27.7
1909 .....	2.57	9.63	7.39	2.24	6.51	21 58	30 12	8 54	39.6
1910 .....	2.52	9.60	7.40	2.20	6.58	22 38	29 67	7 29	32.6
1911 .....	2.63	9.19	7.42	1.77	6.72	22 58	29 98	7 40	32.8
1912 .....	2.64	9.17	7.43	1.74	6.71	22 54	29 43	6 89	30.6
1913 .....	2.63	9.28	7.74	1.54	7.13	23 22	29 37	6 15	20.9
1914 .....	2.66	9.24	7.75	1.49	6.91	22 40	29 51	7 11	24.1
1915 .....	2.70	9.78	8.19	1.59	3.54	22 11	30 95	8 84	28.6
1916 .....	2.39	10.67	8.98	1.69	1.39	.....	32 43	.....	.....

## GROUND BONE

Forty-three samples of ground bone were examined during the inspection, and the results are tabulated on subsequent pages.

The average fineness and composition of the samples examined during the past ten years, together with the average valuations, omitting the valuation for 1916, and selling prices are as follows:

	Fine	Coarse	Nitrogen	Phosphoric Acid	Valuation	Selling Price
	%	%	%	%		
Average 1907 .....	60	40	2.85	23.49	\$27 54	\$28 32
" 1908 .....	57	43	3.06	23.27	27 70	28 82
" 1909 .....	63	37	2.98	24.01	26 07	28 23
" 1910 .....	66	34	2.77	24.27	28 70	29 83
" 1911 .....	65	35	2.64	23.11	27 31	28 69
" 1912 .....	57	43	2.99	22.89	27 73	31 12
" 1913 .....	60	40	2.83	23.53	27 62	32 44
" 1914 .....	60	40	2.82	23.24	29 97	32 40
" 1915 .....	57	43	2.96	23.77	29 24	33 50
" 1916 .....	53	47	2.80	23.80	.....	39 50

SUMMARY OF THE RESULTS OBTAINED WITH THE MIXED FERTILIZERS  
EXAMINED DURING THE INSPECTION OF 1916

MANUFACTURER AND ADDRESS	Number of Brands Received	Number of Samples Examined	Number of Samples Satisfied Guarantees	Number of Samples Substan- tially Equal to Guarantees*	Number of Samples Deficient in—					
					Nitrogen	Phosphoric Acid	Potash	One Element	Two Elements	Three Elements
Acme Guano Co., Baltimore, Md.....	7	7	...	3	3	1	...	4	...	...
American Agricultural Chem. Co., New York City.	70	73	9	41	21	...	3	22	1	...
American Fertilizer Co., Baltimore, Md.....	2	2	...	1	...	1	...	1	...	...
Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.....	22	23	2	7	10	7	2	9	5	...
Atlantic Fertilizer Works, Baltimore, Md.....	2	2	...	...	2	...	...	2	...	...
Jas. A. Baird and Son Marlboro, N. J.....	3	3	1	...	1	1	...	2	...	...
Baugh and Sons Co., Philadelphia, Pa.....	23	23	5	14	4	...	...	4	...	...
Bennett and Bennett, Prospect Plains, N. J.....	2	2	...	1	1	...	...	1	...	...
The Berg Co., Philadelphia, Pa.....	3	3	1	...	1	1	...	2	...	...
Berger Bros., Easton, Pa.....	1	1	...	1	...	...	...	...	...	...
Bowker Fertilizer Co., New York City.....	13	14	2	9	3	...	...	3	...	...
Burlington County Produce Sales Co., Mt. Holly, N. J.....	5	5	1	1	1	2	...	3	...	...
Burlington Supply Co., Burlington, N. J.....	3	3	1	...	2	...	...	2	...	...
E. M. Carman, Englewood, N. J.....	1	1	...	...	...	...	...	...	...	...
Chamberlain & Barclay, Cranbury, N. J.....	1	1	...	...	1	...	...	1	...	...
Coe-Mortimer Co., New York City.....	11	13	4	4	5	...	...	5	...	...
J. S. Collins & Son, Inc., Moorestown, N. J.....	3	3	1	1	1	...	...	1	...	...
Consumers Chemical Corporation, New York City.	6	6	2	2	2	...	...	2	...	...
J. G. Downward Co., Coatesville, Pa.....	3	3	1	2	...	...	...	...	...	...
J. Dugan, Moorestown, N. J.....	2	2	...	1	1	...	...	1	...	...
Farmers Co-operative Association, Trenton, N. J.	4	4	...	2	2	...	...	2	...	...
M. Feinstein, Bridgeton, N. J.....	2	2	...	1	...	1	...	1	...	...
Fogg and Hires Co., Salem, N. J.....	1	1	...	...	1	...	...	1	...	...
Godfrey Co-operative Fertilizer and Chemical Co., Newark, N. J.....	13	13	1	5	5	3	...	6	1	...
Jas. C. Griscom, Woodbury, N. J.....	2	2	1	1	...	...	...	...	...	...
Thos. Y. Hackett, Daretown, N. J.....	1	1	1	...	...	...	...	...	...	...
Hendrickson and Dilatush, Robbinsville, N. J....	6	6	3	3	...	...	...	...	...	...
S. M. Hess and Bro., Inc., Philadelphia, Pa.....	11	11	3	7	1	...	...	1	...	...
Heritage and Bro., Mullica Hill, N. J.....	4	4	1	3	...	...	...	...	...	...
Thos. Hill, Flemington, N. J.....	1	1	...	1	...	...	...	...	...	...
P. Hoffman and Bro., Raubsville, Pa.....	2	2	...	...	1	2	1	1	...	...
Hubbard Fertilizer Co., Baltimore, Md.....	3	3	1	1	1	...	...	1	...	...
Hudson Carbon Co., Ballston Spa, N. Y.....	3	3	3	...	...	...	...	...	...	...
H. H. Hutchinson, Jr., Robbinsville, N. J.....	2	2	...	2	...	...	...	...	...	...
International Seed Co., Rochester, N. Y.....	5	5	2	3	...	...	...	...	...	...
H. B. Kemp, Long Branch, N. J.....	3	3	...	2	1	...	...	1	...	...
Keystone Bone Fertilizer Co., Philadelphia, Pa...	8	8	...	3	2	3	2	4	...	1
Wm. Lancaster, Philadelphia, Pa.....	3	3	1	1	1	1	...	...	1	...
C. A. Lippincott & Bro., Moorestown, N. J.....	1	1	...	1	...	...	...	1	...	...
Listers Agricultural Chem. Works, Newark, N. J.	22	23	8	8	1	6	...	7	...	...

\* Not over 0.2% low in nitrogen, 0.3% low in phosphoric acid or potash.

† Not guaranteed.

# SUMMARY OF THE RESULTS OBTAINED WITH THE MIXED FERTILIZERS EXAMINED DURING THE INSPECTION OF 1916

MANUFACTURER AND ADDRESS	Number of Brands Received	Number of Samples Examined	Number of Samples Satisfied Guarantees	Number of Samples Substan- tially Equal to Guarantees*	Number of Samples Deficient in—					
					Nitrogen	Phosphoric Acid	Potash	One Element	Two Elements	Three Elements
Locke and Black, Swedesboro, N. J.....	4	5	1	3	1			1		
Mapes F. and P. Guano Co., New York City.....	7	7	1	2		4		4		
Martin Fertilizer Co., Philadelphia, Pa.....	7	7	4		1	2		3		
Middlesex Fertilizer Co., Plainfield, N. J.....	3	3	1	2						
Mitchell Fertilizer Co., Tremley, N. J.....	2	2	2							
Monmouth County Farmers' Ex., Freehold, N. J.	4	4	2	2						
Jos. R. Moore, Swedesboro, N. J.....	7	7	1	5	1			1		
Nassau Fertilizer Co., New York City.....	6	6	3	3						
Albert Nelson, Allentown, N. J.....	6	6	3	2		1		1		
J. F. Noll & Co., Newark, N. J.....	2	2		1		1		1		
Patapasco Guano Co., Baltimore, Md.....	5	5	1	2	2			2		
Philadelphia Guano Works, Philadelphia, Pa.....	6	6	3	3						
Rasin Monumental Co., Baltimore, Md.....	9	9	4	2	2	1		3		
Reading Bone Fertilizer Co., Reading, Pa.....	4	4		1	2	2		2	1	
Robt. A. Reichard, Allentown, Pa.....	1	1		1						
Ellwood Roberts Co., Philadelphia, Pa.....	3	3	1	1	1			1		
F. S. Royster Guano Co., Baltimore, Md.....	13	15	2	5	6	4		6	2	
Schanck, Hutchinson and Field, Hightstown, N. J.	5	5	3	1	1			1		
Scott Fertilizer Co., Elkton, Md.....	7	7	1	1	2	4		4	1	
Sea Board Utilization Co., Long Branch, N. J....	1	1	1							
M. L. Shoemaker & Co., Ltd., Philadelphia, Pa...	2	2	1	1						
Harry L. Sickel, Woodbury, N. J.....	8	8	4	4						
South Jersey Farmers' Ex., Woodstown, N. J....	19	26	2	11	9	6	1	10	3	
Standard Guano Co., Baltimore, Md.....	10	10	2	5	2	1	1	2	1	
H. Stanley, Westville, N. J.....	1	1		1						
Swift and Co., Baltimore, Md.....	13	13		1	7	6		11	1	
Swift and Co., Kearny, N. J.....	29	29	7	6	10	12		10	6	
Taylor Bros., Camden, N. J.....	2	2		1			1	1		
Taylor Provision Co., Trenton, N. J.....	2	2	1	1						
I. P. Thomas & Son Co., Philadelphia, Pa.....	13	13	5	3	4	1	1	4	1	
Trenton Bone Fertilizer Co., Trenton, N. J.....	9	9	3	4	2			2		
F. W. Tunnell & Co., Inc., Philadelphia, Pa.....	27	34	6	6	11	9	3	21	1	
J. E. Tygert Co., Philadelphia, Pa.....	9	9	1	7	1			1		
Virginia-Carolina Chemical Co., New York City..	12	12	1	5	5	2		5	1	
A. J. Vreeland, Matawan, N. J.....	1	1		1						
J. Wenderoth & Sons, Camden, N. J.....	4	4	3	1						
West Jersey Marl and Trans. Co., Woodbury, N. J.	13	13	1	9	3			3		
W. E. Whann Co., Philadelphia, Pa.....	3	3		2	1	1			1	
William Wilde, Vineland, N. J.....	2	2		1	1			1		
Abbott Worthley Co., Marlboro, N. J.....	3	4		3		1		1		
J. R. Wyckoff, Princeton Junction, N. J.....	1	2			2			2		

\* Not over 0.2% low in nitrogen, 0.3% low in phosphoric acid or potash.

# COMPLETE FERTILIZERS Furnishing Nitrogen, Phosphoric Acid and Potash

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED
	American Agricultural Chemical Co., New York City.	
160430	Ammoniated Fertilizer A .....	Neshanic .....
16401	Ammoniated Fertilizer AA .....	Bridgeton .....
16402	Ammoniated Fertilizer AAA .....	Bridgeton .....
160036	Eagle Phosphate .....	Crosswicks .....
160197	Odorless Grass and Lawn Top Dressing, 1916 .....	Trenton .....
16404	Great Truck Special .....	Bridgeton .....
16985	Sterling Truck and Top Dressing Mixture .....	New Monmouth .....
160534	Bradley's New Method Fertilizer, 1916 .....	Florham Park .....
160535	Bradley's Potato Manure, 1916 .....	Florham Park .....
16792	Crocker's Complete Manure, 1916 .....	Toms River .....
160180	Crocker's Harvest Jewel Fertilizer, 1916 .....	East Millstone .....
160451	Crocker's Ammoniated Superphosphate .....	Englewood .....
160258	East India Unexcelled Fertilizer, 1916 .....	Millington .....
160505	East India Economizer Phosphate, 1916 .....	Morristown .....
160486	Williams & Clark's Americus H. G. Special for Potatoes and Root Crops, 1916 .....	Milltown .....
160473	Williams & Clark's Meadow Queen Fertilizer, 1916 .....	Dundee Lake .....
16897	Williams & Clark's Americus Corn Phosphate, 1916 .....	Matawan .....
160513	Williams & Clark's Special Prolific Crop Producer .....	Montville .....
	Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.	
16212	Armour's 3-10 .....	Glassboro .....
160310	Armour's 2-11 .....	New Germantown .....
160153	Armour's 1½-9 .....	Cranbury .....
160311	Armour's Wheat, Corn and Oats Special .....	New Germantown .....
16862	Armour's 4-8-1 .....	Medford .....
16864	Armour's 4-8-2 .....	Medford .....
16931	Armour's 5-8-1 .....	Matawan .....
16932	Armour's 2½-8-1 .....	Matawan .....
160586	Armour's 2-8-1 .....	Branchville .....
160587	Armour's 2-8-2 .....	Sussex .....
160618	*Armour's Wheat Fertilizer .....	Skillman .....
	Baugh & Sons Co., Philadelphia, Pa.	
160130	Baugh's Excelsior Guano, 1916 .....	Dayton .....
160478	Baugh's Peruvian Guano Substitute for Potatoes and All Vegetables, 1916 .....	Signac .....
16968	Baugh's Double Eagle Phosphate .....	Mt. Holly .....
16715	Baugh's Balanced Plant Food. A Superior Fertilizer for General Use, 1916 .....	Cologne .....
16709	Baugh's Corn and Oats Fertilizer .....	Cologne .....
16339	Baugh's Superb Potato Phosphate, 1916 .....	Woodstown .....
16738	Baugh's Strawberry Mixture, 1916 .....	Toms River .....
160132	Baugh's Fish, Bone and Potash, 1916 .....	Dayton .....

\* Fall sample.

COMPLETE FERTILIZERS  
Furnishing Nitrogen, Phosphoric Acid and Potash

NITROGEN						PHOSPHORIC ACID						POTASH		
As Nitrates	As Ammonia Salts	As Soluble Organic	As Insoluble Organic	Total Found	Total Guaranteed	Soluble in Water	Soluble in Ammonium Citrate	Insoluble	Total Found	Total Guaranteed	Available		Found	Guaranteed
											Found	Guaranteed		
Tr.	0.08	0.42	0.47	0.97	0.82	5.96	4.27	1.56	11.79	11.00	10.23	10.00	.....	.....
....	0.52	0.59	0.61	1.72	1.65	4.60	5.37	1.71	11.68	11.00	9.97	10.00	.....	.....
....	0.84	0.72	1.04	2.60	2.47	6.70	4.53	1.44	12.67	11.00	11.23	10.00	.....	.....
0.19	0.32	0.45	0.39	1.35	0.82	3.52	5.16	0.98	9.66	8.00	8.68	7.00	0.66	1.00
1.76	0.78	0.08	0.98	3.60	3.70	4.38	4.14	0.76	9.28	9.00	8.52	8.00	0.86	1.00
0.78	1.83	0.04	0.98	3.63	4.11	7.00	3.80	1.20	12.00	11.00	10.80	10.00	.....	.....
2.13	2.42	0.42	1.25	6.22	6.58	5.40	2.89	0.57	8.86	9.00	8.29	8.00	.....	.....
....	0.03	0.24	0.51	0.78	0.82	5.10	3.40	1.50	10.00	9.00	8.50	8.00	0.86	1.00
....	0.93	0.47	0.59	1.99	2.47	6.08	3.64	1.20	10.92	10.00	9.72	9.00	0.84	1.00
0.21	0.45	0.30	0.54	1.50	0.82	5.84	5.35	1.07	12.26	11.00	11.19	10.00	0.96	1.00
Tr.	0.43	0.50	0.59	1.52	1.65	6.12	4.21	1.19	11.52	10.00	10.33	9.00	0.92	1.00
Tr.	1.43	0.49	0.69	2.61	2.47	7.36	3.48	1.11	11.95	10.00	10.84	9.00	0.96	1.00
....	0.82	0.83	0.60	2.25	2.06	5.24	3.13	2.44	10.81	9.00	8.37	8.00	1.01	1.00
Tr.	0.08	0.57	0.28	0.93	0.82	5.18	4.22	1.52	10.92	9.00	9.40	8.00	0.85	1.00
....	1.60	0.53	1.00	3.13	3.29	7.10	3.56	0.95	11.61	10.00	10.66	9.00	1.02	1.00
0.22	1.23	0.30	0.79	2.54	2.47	7.36	3.09	1.15	11.60	10.00	10.45	9.00	0.87	1.00
0.24	0.32	0.59	0.44	1.59	1.65	7.34	4.00	0.89	12.23	11.00	11.34	10.00	0.88	1.00
....	0.08	0.23	0.54	0.85	0.82	4.98	3.72	1.47	10.17	9.00	8.70	8.00	0.85	1.00
Tr.	1.13	0.25	1.08	2.46	2.47	7.48	2.36	1.00	10.84	10.50	9.84	10.00	.....	.....
....	0.81	0.21	0.65	1.67	1.65	8.86	2.39	1.77	13.02	11.50	11.25	11.00	.....	.....
....	0.61	0.22	0.48	1.31	1.23	6.74	3.17	1.31	11.22	9.50	9.91	9.00	.....	.....
....	0.26	0.32	0.59	1.17	0.82	5.44	1.50	0.52	7.46	7.50	6.94	7.00	1.02	1.00
Tr.	1.42	0.37	1.34	3.13	3.29	5.96	1.96	0.93	8.85	8.50	7.92	8.00	1.18	1.00
0.38	0.64	0.63	1.37	3.02	3.29	5.38	2.28	2.25	9.91	8.50	7.66	8.00	2.30	2.00
....	0.81	0.32	2.56	3.69	4.11	4.52	3.21	1.64	9.37	8.50	7.73	8.00	1.30	1.00
....	0.30	0.32	1.33	1.95	2.06	4.54	3.06	1.40	9.00	8.50	7.60	8.00	1.16	1.00
....	0.18	0.46	0.45	1.09	1.65	5.26	2.18	0.76	8.20	8.50	7.44	8.00	0.99	1.00
....	0.05	0.59	0.81	1.45	1.65	4.84	2.74	1.12	8.70	8.50	7.58	8.00	1.93	2.00
0.27	1.35	0.05	0.86	2.57	2.47	11.28	1.62	0.55	13.45	12.50	12.90	12.00	2.76	3.00
....	0.33	0.27	0.44	1.04	1.02	8.06	3.06	3.08	14.20	10.00	11.12	10.00	1.10	1.00
0.51	2.47	0.20	0.62	3.80	4.12	7.10	1.81	1.34	10.25	8.00	8.91	8.00	0.87	1.00
....	0.77	0.32	0.50	1.59	1.65	7.40	2.84	2.58	12.82	8.50	10.24	8.50	1.00	1.00
0.24	0.58	0.10	0.68	1.60	1.65	6.48	4.70	1.77	12.95	10.00	11.18	10.00	1.09	1.00
....	0.13	0.40	1.23	1.76	1.65	6.64	3.27	3.41	13.32	10.00	9.91	10.00	.....	.....
....	2.98	0.35	0.71	4.04	4.12	9.22	1.61	0.74	11.57	10.00	10.83	10.00	.....	.....
....	1.42	0.25	0.99	2.66	2.47	8.44	2.73	1.73	12.90	10.00	11.17	10.00	1.17	1.00
....	1.42	0.22	1.03	2.67	3.30	8.66	2.51	1.73	12.90	10.00	11.17	10.00	1.06	1.00

<sup>1</sup> Inferior quality—activity 49%<sup>3</sup> Inferior quality—activity 44%<sup>2</sup> Inferior quality—activity 47%

# COMPLETE FERTILIZERS Furnishing Nitrogen, Phosphoric Acid and Potash

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED
	Baugh & Sons Co., Philadelphia, Pa.—(Cont.)	
160304	Baugh's Animal Base and Potash Compound for All Crops, 1916	Pittstown .....
160305	Baugh's Peninsula Grain Producer without Potash, 1916.....	Pittstown .....
16737	Baugh's Truckers' Favorite .....	Cologne .....
	Bowker Fertilizer Co., New York City.	
160319	Bowker's Superphosphate with Ammonia 1% .....	New Germantown ...
160318	Bowker's Superphosphate with Ammonia 2% .....	New Germantown ...
160598	Bowker's Staple Phosphate, 1916 .....	Andover .....
160400	Bowker's Sure Crop Phosphate, 1916 .....	North Branch .....
16716	Bowker's Superior Fish Guano for Broadcasting .....	Cologne .....
160581	Bowker's Farm and Garden Phosphate, 1916 .....	Montclair .....
	E. M. Carman, Englewood, N. J.	
160457	Lawn Fertilizer .....	Englewood .....
	Coe-Mortimer Co., New York City.	
16390	E. Frank Coe's Morco Top Dresser, 1916 .....	Blue Anchor .....
160283	E. Frank Coe's Universal Fertilizer, 1916 .....	Hopewell .....
160348	E. Frank Coe's New Englander Special, 1916 .....	Pittstown .....
160284	E. Frank Coe's H. G. Ammoniated Superphosphate, 1916.....	Hopewell .....
160447	E. Frank Coe's Original Ammoniated Dissolved Phosphate, 1916 .....	Closter .....
160349	E. Frank Coe's XXV Ammoniated Phosphate, 1916.....	Pittstown .....
160620	*E. Frank Coe's XXV Ammoniated Phosphate, 1916.....	Skillman .....
160619	*E. Frank Coe's Penn. No. 1 Grain Special .....	Skillman .....
	Consumers Chemical Corporation, New York City.	
160102	Consumers Pure Sure Potato and Vegetable without Potash...	Hightstown .....
160287	Consumers Pure Sure Corn and Grain Bone Phosphate.....	Titusville .....
160292	Consumers Pure Sure Ammoniated Bone Phosphate.....	Titusville .....
	Godfrey Co-operative Fert. and Chem. Co., Newark, N. J.	
160265	Godfrey's Corn Mixture 2-10 Revised .....	Berkeley Heights ...
160269	Godfrey's Potato and Truck Mixture .....	Berkeley Heights ...
160436	Godfrey's Vegetable Mixture 3-10 Revised .....	Somerville .....
160435	Godfrey's Special Mixture 1-10 Revised .....	Somerville .....
160417	Godfrey's General Crop and Corn Fertilizer 2-11-1 Revised...	Three Bridges .....
160509	Godfrey's Special Grain and Sure Crop Fertilizer 1-8-1 Revised	Boonton .....
160510	Godfrey's Grain and Grass Fertilizer 2-8-1 Revised.....	Boonton .....
	Hendrickson & Dilatash, Robbinsville, N. J.	
160048	Ferris Grass Manure No. 2 .....	Robbinsville .....
160050	Truckers' Manure No. 2 .....	Robbinsville .....
	S. M. Hess & Bro., Inc., Philadelphia, Pa.	
160576	Market Gardeners' Manure .....	Brookdale .....
16781	Top Dressing Manure .....	Lakewood .....
16639	Potato Manure, 1916 .....	Rio Grande .....
160280	Special Corn Manure, 1916 .....	Lambertville .....
16641	Big Crop Fertilizer, 1916 .....	Rio Grande .....
160361	Keystone Phosphate .....	Annandale .....

\* Fall shipment

COMPLETE FERTILIZERS  
Furnishing Nitrogen, Phosphoric Acid and Potash

NITROGEN						PHOSPHORIC ACID							POTASH	
As Nitrates	As Ammonia Salts	As Soluble Organic	As Insoluble Organic	Total Found	Total Guaranteed	Soluble in Water	Soluble in Ammonium Urate	Insoluble	Total Found	Total Guaranteed	Available		Found	Guaranteed
											Found	Guaranteed		
....	0.84	0.26	0.55	1.65	1.65	7.18	3.09	2.95	13.22	9.00	10.27	9.00	*0.97	1.00
....	0.07	0.18	0.58	0.83	0.82	6.10	3.36	1.84	11.30	9.00	9.46	9.00	....	....
....	0.71	0.35	1.38	2.44	2.47	8.36	1.98	2.12	12.46	10.00	10.34	10.00	....	....
....	0.41	0.12	0.35	0.88	0.82	7.08	3.23	2.38	12.69	11.00	10.31	10.00	....	....
....	0.90	0.30	0.57	1.77	1.65	7.60	3.08	2.22	12.90	11.00	10.68	10.00	....	....
....	0.20	0.22	0.43	0.85	0.82	5.32	3.48	1.40	10.20	9.00	8.80	8.00	0.87	1.00
....	0.05	0.24	0.58	0.87	0.82	7.38	3.56	1.41	12.35	11.00	10.94	10.00	0.90	1.00
0.54	0.48	0.55	1.06	2.63	3.29	0.52	4.84	1.49	6.85	6.00	5.36	5.00	1.07	1.00
0.21	0.32	0.36	0.61	1.50	1.65	6.96	3.59	1.76	12.31	11.00	10.55	10.00	0.94	1.00
....	0.53	0.11	0.52	1.16	....	Tr.	3.50	3.52	7.02	....	3.50	....	0.74	....
2.81	3.14	0.56	0.96	7.47	8.23	2.70	3.24	0.80	6.74	6.00	5.94	5.00	*1.19	1.00
....	0.15	1.24	0.43	1.82	1.65	4.76	4.47	1.89	11.12	10.00	9.23	9.00	0.83	1.00
Tr.	0.05	0.42	0.35	0.82	0.82	3.92	4.46	1.59	9.97	9.00	8.38	8.00	0.82	1.00
....	0.69	0.97	0.86	2.52	2.47	6.72	3.31	1.86	11.89	11.00	10.03	10.00	....	....
....	0.44	0.41	0.55	1.40	1.65	7.28	2.95	1.33	11.56	11.00	10.23	10.00	....	....
Tr.	0.21	0.39	0.54	1.14	0.82	5.74	4.86	1.17	11.77	11.00	10.60	10.00	....	....
....	0.08	0.62	0.26	0.96	0.82	6.80	3.41	1.29	11.50	11.00	10.21	10.00	....	....
....	0.15	0.52	0.28	0.95	0.82	8.06	2.32	1.82	12.20	11.00	10.38	10.00	0.87	1.00
....	0.34	0.92	1.87	3.13	3.29	5.26	5.41	2.60	13.27	11.00	10.67	10.00	....	....
....	0.23	0.64	0.63	1.50	1.65	8.54	4.21	2.12	14.87	13.00	12.75	12.00	....	....
0.47	0.26	0.55	0.65	1.93	1.65	6.30	4.36	2.96	13.62	11.00	10.66	10.00	....	....
....	0.61	0.15	0.85	1.61	1.65	6.40	2.69	1.41	10.50	10.50	9.09	10.00	....	....
....	1.74	0.55	1.61	3.90	4.11	7.72	2.31	1.35	11.38	10.50	10.03	10.00	....	....
....	0.49	0.18	1.43	2.10	2.47	6.60	2.70	2.33	11.63	10.50	9.30	10.00	....	....
....	0.30	0.10	0.52	0.92	0.82	7.50	2.60	0.93	11.03	10.50	10.10	10.00	....	....
....	0.65	0.11	0.84	1.60	1.65	9.14	2.39	0.94	12.47	11.50	11.53	11.00	0.87	1.00
....	0.15	0.17	0.52	0.84	0.82	4.62	2.76	0.89	8.27	8.50	7.38	8.00	0.91	1.00
....	0.56	0.22	0.77	1.55	1.65	4.62	3.42	0.97	9.01	8.50	8.04	8.00	0.84	1.00
5.78	0.09	1.62	0.86	8.35	8.20	4.64	1.98	0.88	7.50	7.00	6.62	5.00	....	....
1.97	0.08	0.71	1.14	3.90	4.10	8.56	1.84	1.04	11.44	11.00	10.40	9.00	....	....
0.96	1.68	0.22	0.94	3.80	4.11	6.14	2.35	1.76	10.25	9.00	8.49	8.00	....	....
3.13	4.22	0.11	1.35	8.81	8.23	3.72	1.71	0.67	6.10	6.00	5.43	5.00	....	....
Tr.	1.04	0.66	0.67	2.37	2.47	5.80	4.09	1.25	11.14	10.00	9.89	9.00	1.04	1.00
....	0.11	0.34	0.38	0.83	0.82	6.04	4.54	1.48	12.06	11.00	10.58	10.00	0.88	1.00
Tr.	0.60	0.52	0.51	1.63	1.65	5.72	5.29	1.39	12.40	11.00	11.01	10.00	0.91	1.00
....	0.17	0.27	0.43	0.87	0.82	3.70	4.28	1.69	9.67	9.00	7.98	8.00	0.91	1.00

\* Potash largely, if not entirely, from sulfate.

<sup>1</sup> Inferior quality—activity 32%

**COMPLETE FERTILIZERS**  
Furnishing Nitrogen, Phosphoric Acid and Potash

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED
	Hudson Carbon Co., Ballston Spa, N. Y.	
160526	A 1 Manure .....	Cranford .....
160528	Davidges' Concentrated Manure .....	Cranford .....
160527	Davidges' Special Phosphorus .....	Cranford .....
	Listers Agricultural Chemical Works, Newark, N. J.	
160256	Listers Standard Superphosphate of Lime, 1916 .....	Millington .....
160015	Brakeley Special Mixture, 1916 .....	Colts Neck .....
160043	Listers Corn and Potato Fertilizer, 1916 .....	Yardville .....
160179	Listers U. S. Superphosphate, 1916 .....	Middlebush .....
160195	Listers Valley Brand Fertilizer, 1916 .....	Pennington .....
160042	A. B. Special Fertilizer .....	Bordentown .....
160122	Listers 4-8-0 .....	Jamesburg .....
160298	Listers Excelsior Guano, 1916 .....	Pittstown .....
160300	Listers Plant Food, 1916 .....	Pittstown .....
160365	Listers Celebrated Ground Bone and Tankage Acidulated.....	Lebanon .....
160250	Listers Success Fertilizer, 1916 .....	Bernardsville .....
160323	Listers Ammoniated Dissolved Superphosphate, 1916.....	Ringoes .....
160469	Listers Potato and Corn No. 2 Fertilizer, 1916 .....	Allendale .....
160390	Listers Special Crop Producer, 1916 .....	Ringoes .....
160477	Listers Harvest Queen Phosphate, 1916 .....	Signac .....
160517	Listers Vegetable Compound, 1916 .....	Fanwood .....
160545	Listers Potato Manure, 1916 .....	Madison .....
160560	Listers Lawn Fertilizer, 1916 .....	Passaic .....
	Nassau Fertilizer Co., New York City.	
160359	Ammoniated Truck Producer .....	White House Station
16297	Common Sense Fertilizer, 1916 .....	Atco .....
16413	Ammoniated Potato Compound .....	Mickleton .....
	Rasin Monumental Co., Baltimore, Md.	
16921	Rasin's Standard Tomato Grower, Revised .....	Swedesboro .....
16919	Rasin's Sweet Potato and Vegetable Manure .....	Swedesboro .....
16920	Rasin's H. G. Potato and Truck Manure, Revised.....	Swedesboro .....
	F. S. Royster Guano Co., Baltimore, Md.	
160370	*Royster's Seeding Down Special Fertilizer .....	White House Station
160440	Royster's Logical Compound .....	Belvidere .....
16573	Royster's Curfew Ammoniated Superphosphate .....	Vineland .....
160383	Royster's Royal Blue Ammoniated Superphosphate.....	Ringoes .....
	Sea Board Utilization Co., Long Branch, N. J.	
16809	Night Soil .....	Long Branch .....
	Swift & Co., Baltimore, Md.	
16372	Swift's Jersey White Potato Fertilizer .....	Salem .....
16586	Swift's Pure Special Formula A .....	Swedesboro .....
16595	Swift's Special Baltimore Formula .....	Swedesboro .....
16903	Swift's Pure Special Top Dresser .....	Matawan .....
16904	Swift's Pure Special A .....	Matawan .....

\* 1915 shipment

# COMPLETE FERTILIZERS Furnishing Nitrogen, Phosphoric Acid and Potash

NITROGEN						PHOSPHORIC ACID						POTASH		
As Nitrates	As Ammonia Salts	As Soluble Organic	As Insoluble Organic	Total Found	Total Guaranteed	Soluble in Water	Soluble in Ammonium Citrate	Insoluble	Total Found	Total Guaranteed	Available		Found	Guaranteed
											Found	Guaranteed		
....	0.04	0.57	<sup>1</sup> 1.35	1.96	1.00	Tr.	1.48	10.55	12.03	1.00	1.48	.....	.....	.....
....	0.07	0.66	<sup>2</sup> 1.80	2.53	1.00	Tr.	1.66	1.43	3.09	1.00	1.66	.....	.....	.....
....	0.05	0.43	<sup>3</sup> 0.70	1.18	.....	Tr.	1.53	10.52	12.05	5.00	1.53	.....	.....	.....
0.89	0.20	0.73	0.52	2.34	2.47	5.68	3.80	1.61	11.09	10.00	9.48	9.00	1.11	1.00
....	2.01	0.53	1.61	4.15	4.11	6.42	2.59	1.74	10.75	9.00	9.01	8.00	*1.27	1.00
....	1.35	0.56	0.46	2.37	2.06	2.02	4.47	3.11	9.60	9.00	6.49	8.00	0.94	1.00
....	0.50	0.25	0.56	1.31	1.23	7.80	3.77	1.02	12.59	11.00	11.57	10.00	1.24	1.00
....	0.12	0.30	0.50	0.92	0.82	7.70	3.65	1.11	12.46	11.00	11.35	10.00	1.20	1.00
1.63	1.56	0.15	1.06	4.40	4.53	7.58	2.60	1.92	12.10	11.00	10.18	10.00	.....	.....
0.96	0.20	0.67	1.28	3.11	3.29	1.62	5.08	3.44	10.14	9.00	6.70	8.00	.....	.....
1.02	0.21	0.61	0.91	2.75	2.47	5.40	3.79	3.29	12.48	11.00	9.19	10.00	.....	.....
....	0.14	0.43	0.57	1.14	0.82	7.12	3.56	1.62	12.30	11.00	10.68	10.00	.....	.....
0.59	0.21	0.48	1.53	2.81	2.67	2.58	4.41	7.00	13.99	12.00	6.99	.....	.....	.....
....	0.44	0.25	0.61	1.30	1.23	6.98	4.49	1.32	12.79	11.00	11.47	10.00	0.97	1.00
0.92	0.84	0.08	0.32	2.16	2.06	4.40	4.51	0.73	9.64	9.00	8.91	8.00	1.08	1.00
....	0.93	0.42	0.85	2.20	2.06	7.18	4.43	0.93	12.54	11.00	11.61	10.00	*0.92	1.00
....	0.05	0.44	0.48	0.97	0.82	4.20	4.35	1.75	10.30	9.00	8.55	8.00	1.03	1.00
....	0.47	0.17	0.64	1.28	1.23	7.30	3.75	1.63	12.68	11.00	11.05	10.00	*1.14	1.00
....	2.07	0.33	1.33	3.73	4.11	6.12	3.13	0.93	10.18	9.00	9.25	8.00	*3.18	1.00
1.14	1.76	0.41	0.64	3.95	4.11	3.00	4.84	2.22	10.06	9.00	7.84	8.00	*1.17	1.00
Tr.	1.31	0.54	0.47	2.32	2.06	2.50	4.35	2.70	9.55	9.00	6.85	8.00	0.86	1.00
....	1.19	1.26	1.08	3.53	3.00	7.60	2.51	1.61	11.72	11.00	10.11	10.00	.....	.....
....	0.56	0.64	0.62	1.82	1.65	5.52	4.64	1.49	11.65	11.00	10.16	10.00	.....	.....
0.36	0.91	0.47	0.84	2.58	2.47	6.24	3.93	2.06	12.23	11.00	10.17	10.00	.....	.....
....	0.81	0.03	0.17	1.01	0.82	5.10	3.15	1.24	9.49	9.00	8.25	8.00	2.45	2.00
Tr.	1.09	0.30	<sup>4</sup> 0.35	1.74	1.65	5.26	3.41	1.59	10.26	9.00	8.67	8.00	2.00	2.00
0.19	2.11	0.08	0.93	3.31	3.29	5.60	2.54	1.65	9.79	9.00	8.14	8.00	2.15	2.00
....	0.50	0.06	0.37	0.93	0.82	4.72	4.76	1.11	10.59	9.50	9.48	9.00	3.10	3.00
....	0.45	0.43	<sup>5</sup> 0.69	1.57	1.65	2.50	5.11	1.78	9.39	8.50	7.61	8.00	1.05	1.00
....	1.29	0.31	1.37	2.97	3.29	5.06	1.89	2.58	9.53	8.50	6.95	8.00	.....	.....
....	0.30	0.31	0.33	0.94	0.82	7.32	3.37	1.25	11.94	10.50	10.69	10.00	.....	.....
Tr.	0.18	0.14	<sup>6</sup> 0.90	1.22	1.15	0.48	2.12	0.30	2.90	2.64	2.60	.....	.....	.....
0.30	0.40	0.39	2.76	3.85	3.29	2.00	4.00	1.45	7.45	8.00	6.00	8.00	.....	.....
Tr.	0.61	0.64	2.91	4.16	3.29	2.74	4.16	1.56	8.46	8.00	6.90	8.00	.....	.....
0.20	0.43	0.34	2.13	3.10	3.29	7.28	3.15	2.04	12.47	10.00	10.43	10.00	.....	.....
....	1.51	0.42	5.54	7.47	8.22	3.86	2.17	0.87	6.90	5.00	6.03	5.00	.....	.....
0.89	0.19	0.04	<sup>7</sup> 0.77	1.89	2.47	4.72	3.12	1.03	8.87	8.00	7.84	8.00	.....	.....

\* Potash largely, if not entirely, from sulfate.

<sup>1</sup> Inferior quality—activity 47%

<sup>2</sup> Inferior quality—activity 28%

<sup>3</sup> Inferior quality—activity 27%

<sup>4</sup> Inferior quality—activity 44%

<sup>5</sup> Inferior quality—activity 46%

<sup>6</sup> Inferior quality—activity 40%

<sup>7</sup> Inferior quality—activity 46%

COMPLETE FERTILIZERS  
Furnishing Nitrogen, Phosphoric Acid and Potash

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED
	Swift & Co., Kearny, N. J.	
16909	Swift's Pure Cranberry Grower .....	New Lisbon .....
16891	Swift's Pure Special Diamond A Fertilizer .....	Vincentown .....
16950	Swift's Pure Top Dressing .....	Delair .....
16952	Swift's Pure Special Long Island Trucker .....	Fish House .....
16860	Haines' Garden and Truck .....	Medford .....
160093	*Swift's Pure Dessicated Bone and Potash .....	Hightstown .....
160339	Swift's Pure Special Corn Grower .....	Gladstone .....
160337	Swift's Pure Diamond B Potato Fertilizer .....	Far Hills .....
160142	Swift's Pure Special C Grain Fertilizer .....	Monmouth Junction .....
160158	Swift's Pure Long Island Favorite Fertilizer .....	Plainsboro .....
160575	Swift's Pure Farmers' Favorite for Potatoes .....	Brookdale .....
160340	Swift's Pure Reliable Grain Fertilizer .....	Gladstone .....
160454	Swift's Pure Monmouth Potato Manure .....	Woodbridge .....
160518	Swift's Pure Regal Truck and Potato Fertilizer .....	Plainfield .....
160573	Swift's Pure Pride of Jersey Fertilizer .....	Brookdale .....
160585	Swift's Pure Corn Manure .....	Caldwell .....
	I. P. Thomas & Son Co., Philadelphia, Pa.	
16476	Thorofare Five Per Cent .....	Thorofare .....
16699	Thorofare Sweet Potato .....	Woodbury .....
160385	Farmers' Choice Fertilizer .....	Ringoes .....
160062	Thomas' Wheat and Corn Guano .....	Englishtown .....
	F. W. Tunnell & Co., Inc., Philadelphia, Pa.	
16105	1916 Jersey Fish Guano .....	Riverton .....
16199	1916 Sweet and White Potato Guano .....	Haddonfield .....
16378	1916 Potato and Vegetable Manure .....	Bridgeton .....
160373	1916 Excelsior Phosphate .....	White House Station .....
16276	1916 Pride of Jersey .....	Daretown .....
16275	1916 Truck Manure .....	Daretown .....
16211	Royal Fish Manure .....	Glassboro .....
16277	1916 Empire Potato Manure .....	Daretown .....
160406	*Universal Corn Grower .....	Annandale .....
16832	1916 Raw and Acidulated Animal Compound .....	Marlton .....
160244	1916 Corn Fertilizer .....	Bernardsville .....
160371	Wheat Grower .....	White House Station .....
	Virginia-Carolina Chemical Co., New York City.	
160034	V. C. C. Co.'s Double Owl Brand Potato and Truck Fertilizer without Potash .....	Columbus .....
16177	V. C. C. Co.'s High Grade Corn and Vegetable Compound without Potash .....	Elmer .....
16855	V. C. C. Co.'s 20th Century Potato Manure without Potash ..	Masonville .....

\* 1915 shipment.

# COMPLETE FERTILIZERS

## Furnishing Nitrogen, Phosphoric Acid and Potash

NITROGEN						PHOSPHORIC ACID								POTASH	
As Nitrates	As Ammonia Salts	As Soluble Organic	As Insoluble Organic	Total Found	Total Guaranteed	Soluble in Water Soluble in	Ammonium Citrate	Insoluble	Total Found	Total Guaranteed	Available		Found	Guaranteed	
											Found	Guaranteed			
....	0.57	0.74	1.52	2.83	3.28	3.94	3.38	2.32	9.64	10.00	7.32	10.00	....	....	
....	1.21	0.24	0.77	2.22	2.47	5.80	1.65	0.75	8.20	8.00	7.45	8.00	....	....	
1.92	1.46	0.01	3.38	6.77	8.23	4.10	1.77	0.43	6.30	5.00	5.87	5.00	....	....	
....	2.57	0.60	1.21	4.38	4.94	5.90	2.12	1.43	9.45	8.00	8.02	8.00	....	....	
1.08	0.36	0.21	1.29	2.94	3.29	5.02	2.52	2.42	9.96	8.00	7.54	8.00	1.07	1.00	
....	0.04	0.28	0.71	1.03	0.82	....	7.29	17.51	24.80	25.00	7.29	....	1.97	2.00	
....	0.75	0.28	0.61	1.64	1.65	5.10	3.52	1.40	10.02	10.00	8.62	10.00	....	....	
....	0.51	0.29	0.55	1.35	1.65	3.26	2.87	0.89	7.02	8.00	6.13	8.00	....	....	
....	0.06	0.28	0.61	0.95	0.82	3.80	4.44	1.56	9.80	8.00	8.24	8.00	....	....	
....	2.08	0.46	1.36	3.90	4.11	7.74	1.77	2.07	11.58	10.00	9.51	10.00	....	....	
....	1.68	0.64	1.01	3.33	3.29	7.60	3.16	2.14	12.90	12.00	10.76	12.00	....	....	
0.25	0.19	0.19	0.67	1.30	0.82	3.06	4.37	1.67	9.10	8.00	7.43	8.00	1.00	1.00	
0.93	0.18	0.46	1.29	2.86	3.29	4.70	3.50	2.26	10.46	8.00	8.20	8.00	1.20	1.00	
0.89	0.07	0.73	0.89	2.58	2.47	5.88	1.33	1.94	9.15	9.00	7.21	9.00	1.14	1.00	
2.27	0.12	0.60	0.58	3.57	4.11	4.12	2.67	1.21	8.00	8.00	6.79	8.00	1.45	1.00	
0.73	0.06	0.13	1.57	1.49	1.65	4.74	2.77	1.12	8.63	8.00	7.51	8.00	*1.07	1.00	
....	1.48	1.12	1.47	4.07	4.12	7.80	2.74	2.49	13.03	....	10.54	10.00	....	....	
....	0.26	0.75	0.64	1.65	1.65	5.84	4.53	1.23	11.60	....	10.37	10.00	....	....	
....	0.80	0.31	1.10	2.21	2.45	8.02	2.83	1.26	12.11	10.50	10.85	10.00	....	....	
Tr.	0.48	1.00	0.92	2.40	1.65	4.96	5.57	2.02	12.55	10.50	10.53	10.00	....	....	
....	1.19	1.27	1.19	3.65	3.71	2.04	3.67	2.64	8.35	7.00	5.71	6.00	....	....	
....	0.55	0.35	1.05	1.95	1.84	1.60	6.92	3.93	12.45	11.00	8.52	10.00	....	....	
....	0.39	0.36	1.23	1.98	1.64	1.92	5.12	5.16	12.20	11.00	7.04	10.00	....	....	
....	0.16	0.12	<sup>2</sup> 0.56	0.84	0.82	0.64	6.29	1.08	8.01	7.00	6.93	6.00	....	....	
....	1.16	1.56	0.76	3.48	3.30	2.00	5.75	2.82	10.57	8.00	7.75	7.00	1.70	2.00	
....	1.09	0.68	0.86	2.63	4.12	5.46	2.40	1.71	9.57	7.00	7.86	6.00	1.83	1.00	
....	0.37	0.19	1.25	1.81	1.64	1.70	5.03	5.75	12.48	8.00	6.73	7.00	0.38	1.00	
....	0.80	0.84	0.97	2.61	2.46	4.60	3.58	2.27	10.45	8.00	8.18	7.00	1.39	2.00	
....	0.18	0.63	<sup>3</sup> 0.76	1.57	1.64	3.64	3.42	1.74	8.80	8.00	7.06	7.00	1.23	2.00	
....	0.20	0.61	0.46	1.27	1.64	6.92	4.41	9.62	20.95	15.00	11.33	10.00	....	....	
....	1.22	0.36	<sup>4</sup> 0.76	2.34	2.46	8.04	2.53	1.03	11.60	11.00	10.57	10.00	....	....	
....	0.12	0.08	<sup>5</sup> 0.71	0.91	0.82	1.68	8.07	1.79	11.54	10.00	9.75	9.00	....	....	
0.81	0.20	0.76	1.15	2.92	3.29	6.32	4.37	2.56	13.25	11.00	10.69	10.00	....	....	
0.73	0.26	0.69	0.71	2.39	2.47	3.24	6.10	2.91	12.25	11.00	9.34	10.00	....	....	
1.59	0.11	0.90	0.89	3.53	4.12	6.64	4.50	1.66	12.80	11.00	11.14	10.00	....	....	

\* Potash largely, if not entirely, from sulfate.

<sup>1</sup> Inferior quality—activity 25%<sup>2</sup> Inferior quality—activity 35%<sup>3</sup> Inferior quality—activity 48%<sup>4</sup> Inferior quality—activity 44%<sup>5</sup> Inferior quality—activity 40%

## COMPLETE FERTILIZERS

Furnishing Nitrogen, Phosphoric Acid and Potash

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED
	Virginia-Carolina Chemical Co., New York City.—(Cont.)	
160045	V. C. C. Co.'s Ammoniated Bone Phosphate for All Crops....	Yardville .....
160150	C & B XXXX Fish and Potash Potato Manure without Potash	Cranbury .....
	West Jersey Marl & Trans. Co., Woodbury, N. J.	
16642	Special White Potato Manure, 1916 .....	Cold Spring .....
16215	Bone and Potash, 1916 .....	Glassboro .....
16431	Special Sweet Potato Manure, 1916 .....	Gloucester .....
16217	Our 4-8-0 Brand .....	Glassboro .....
16428	Special Mixture No. 1 .....	Thorofare .....
16427	Special Mixture No. 2 .....	Thorofare .....
	W. E. Whann Co., Philadelphia, Pa.	
16671	Whann's Chester Valley No. 2 Ammoniated Superphosphate, 1916 .....	Swedesboro .....
16672	John Whann's Sons Sweet Potato Fertilizer, 1916 .....	Swedesboro .....
16908	Whann's Chester Valley High Grade Truck Manure, 1916....	Wrightstown .....
	William Wilde, Vineland, N. J.	
16488	Strawberry .....	Vineland .....
16489	General Crop .....	Vineland .....

## HUMUS AND MANURES

Furnishing Nitrogen, Phosphoric Acid and Potash

	Alphano Humus Co., New York City.		
160525	Alphano Humus .....		Plainfield .....
	H. B. Kemp, Long Branch, N. J.		
16805	Kemp's Pulverized Sheep Manure .....		Long Branch .....
	Natural Guano Co., Aurora, Ill.		
16435	Sheep Head Brand Pulverized Sheep Manure .....		Bridgeton .....
	New York Stable Manure Co., Jersey City, N. J.		
160579	Dried Ground Manure Compost (Diamond Brand).....		Montclair .....
	J. F. Noll & Co., Inc., Newark, N. J.		
160565	Sheep Manure .....		Newark .....
	Pulverized Manure Co., Chicago, Ill.		
160529	Wizard Brand Pulverized Sheep Manure .....		Plainfield .....
	Swift & Co., Kearny, N. J.		
16352	Swift's Pulverized Sheep Manure .....		Camden .....
16807	Swift's Pure Shredded Cattle Manure .....		Long Branch .....
	Vaughan Seed Store, Chicago, Ill.		
160474	Vaughan's Sheep Manure .....		Paterson .....

COMPLETE FERTILIZERS  
Furnishing Nitrogen, Phosphoric Acid and Potash

NITROGEN						PHOSPHORIC ACID							POTASH	
As Nitrates	As Ammonia Salts	As Soluble Organic	As Insoluble Organic	Total Found	Total Guaranteed	Soluble in Water	Soluble in Ammonium Citrate	Insoluble	Total Found	Total Guaranteed	Available		Found	Guaranteed
											Found	Guaranteed		
....	0.33	0.75	0.73	1.81	1.65	4.98	5.18	2.52	12.68	11.00	10.16	10.00	.....	.....
Tr.	0.31	0.74	1.48	2.53	3.29	4.92	2.18	3.37	10.47	9.00	7.10	8.00	.....	.....
0.54	0.47	0.45	<sup>1</sup> 0.94	2.40	2.47	3.50	2.79	2.64	8.93	6.00	6.29	6.00	*0.97	1.00
....	0.31	0.73	<sup>2</sup> 0.53	1.57	1.65	1.56	7.56	1.43	10.55	8.00	9.12	8.00	2.07	2.00
....	0.47	0.49	<sup>3</sup> 0.80	1.76	1.65	5.94	3.28	2.58	11.80	8.00	9.22	8.00	*0.95	1.00
....	1.28	0.32	1.49	3.09	3.29	6.14	1.89	2.49	10.52	8.00	8.03	8.00	.....	.....
0.34	0.43	0.29	2.83	3.89	4.12	8.68	1.40	1.94	12.02	10.00	10.08	10.00	.....	.....
0.37	0.43	0.36	1.59	2.75	3.30	6.56	1.85	2.03	10.44	8.00	8.41	8.00	.....	.....
....	0.33	0.48	0.54	1.35	1.23	5.60	5.39	1.04	12.03	11.00	10.99	10.00	0.96	1.00
Tr.	0.39	0.39	0.57	1.35	1.23	5.66	5.30	1.01	12.07	11.00	11.06	10.00	0.92	1.00
0.44	1.32	0.23	0.70	2.69	3.29	3.80	5.85	1.62	11.27	10.00	9.65	9.00	0.93	1.00
2.31	0.01	0.02	0.05	2.39	2.47	6.40	1.74	0.18	8.32	9.00	8.14	8.00	.....	.....
0.25	0.01	0.47	1.42	2.15	2.47	5.96	3.42	4.96	14.34	9.00	9.38	8.00	.....	.....

\* Potash largely, if not entirely, from sulfate.

<sup>2</sup> Inferior quality—activity 45%<sup>1</sup> Inferior quality—activity 37%<sup>3</sup> Inferior quality—activity 47%

HUMUS AND MANURES  
Furnishing Nitrogen, Phosphoric Acid Potash

....	0.10	....	<sup>1</sup> 1.78	1.88	1.25	Tr.	0.32	1.02	1.34	....	0.32	....	....	....
....	0.35	0.49	<sup>2</sup> 3.09	3.93	2.06	0.66	2.45	1.49	4.60	1.50	3.11	....	1.51	1.50
....	0.16	0.26	<sup>3</sup> 1.96	2.38	2.25	0.88	0.20	0.25	1.33	1.25	1.08	1.00	1.53	1.50
....	0.12	0.13	<sup>4</sup> 2.37	2.62	2.06	Tr.	2.22	0.48	2.70	1.79	2.22	1.50	1.10	1.00
....	0.24	0.73	<sup>5</sup> 2.13	3.10	1.65	1.00	1.22	0.60	2.82	1.00	2.22	....	1.83	1.50
....	0.34	0.32	<sup>6</sup> 1.58	2.24	1.80	0.72	0.58	0.10	1.40	1.00	1.30	....	2.00	1.00
....	0.05	0.21	<sup>7</sup> 1.74	2.00	1.65	Tr.	0.68	0.23	0.91	1.00	0.68	....	1.65	1.50
....	0.06	0.13	<sup>8</sup> 1.86	2.05	1.65	Tr.	1.08	0.16	1.24	1.00	1.08	....	1.54	1.50
....	0.16	0.19	<sup>9</sup> 1.55	1.90	2.00	Tr.	1.20	0.17	1.37	1.20	1.20	1.00	1.75	1.00

<sup>1</sup> Inferior quality—activity 36%<sup>6</sup> Inferior quality—activity 25%<sup>2</sup> Inferior quality—activity 41%<sup>7</sup> Inferior quality—activity 24%<sup>3</sup> Inferior quality—activity 28%<sup>8</sup> Inferior quality—activity 28%<sup>4</sup> Inferior quality—activity 29%<sup>9</sup> Inferior quality—activity 26%<sup>5</sup> Inferior quality—activity 31%

## GROUND BONE

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED	NITROGEN		PHOSPHORIC ACID	
			Finer than 1/50 inch.		Coarser than 1/50 inch	
			Found	Guaranteed	Found	Guaranteed
16399	American Agricultural Chemical Co., New York City.	Bridgeton .....	2.65	2.47	27.20	22.88
16757	Fine Ground Bone .....	New Brunswick .....	3.34	3.29	22.56	20.59
160136	High Grade Ground Bone .....	Cranbury .....	2.67	2.47	25.40	22.00
16074	Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.	Marlboro .....	2.63	....	24.42	....
16755	Bone Meal .....	Moorestown .....	3.74	3.70	22.24	21.50
16946	J. H. Baird & Son, Marlboro, N. J.	West Palmyra .....	1.80	1.65	28.32	25.00
16263	Baugh & Sons Co., Philadelphia, Pa.	Pitman .....	3.29	3.00	20.20	22.00
16990	Baugh's Raw Bone Meal—Warranted Pure .....	Kearnsburg .....	2.60	2.47	27.14	22.88
16820	Baugh's Pure Steamed Bone .....	Manasquan .....	2.50	2.47	26.08	22.88
16146	The Berg Co., Philadelphia, Pa.	Moorestown .....	2.55	2.47	24.48	22.90
160118	Berg's Raw Bone—Fine .....	Rhode Hall .....	2.38	2.47	24.10	23.00
160176	Bowker Fertilizer Co., New York City.	East Millstone .....	2.24	2.48	14.16	20.00—
16804	Bowker's Fresh Ground Bone .....	Long Branch .....	2.68	2.47	24.36	24.00
16806	The Coc-Mortimer Co., New York City.	Long Branch .....	5.03	3.70	20.14	23.00
16318	E. Frank Coe's Fine Ground Bone .....	Elm .....	0.99	2.05	30.46	23.00
	J. S. Collins & Co., Inc., Moorestown, N. J.					
	Ground Steamed Bone .....					
	Godfrey Co-operative Fert. & Chem. Co., Newark, N. J.					
	Godfrey's Pure Bone Meal .....					
	Hubbard Fertilizer Co., Baltimore, Md.					
	Hubbard's Import Bone .....					
	H. B. Kemp, Long Branch, N. J.					
	Kemp's Pure Bone Meal .....					
	Kemp's Raw Bone Meal .....					
	Keystone Bone Fertilizer Co., Philadelphia, Pa.					
	1916 Keystone Pure Ground Bone .....					

## Listers Agricultural Chemical Works, Newark, N. J.

16982	Listers Bone Meal .....	Keyport .....	50	50	2.86	2.47	26.28	23.00
	Martin Fertilizer Co., Philadelphia, Pa.							
16657	Martin's Pure Raw Bone Meal .....	Hammonton .....	35	65	3.76	3.70	23.22	21.00
160126	Martin's Pure Ground Bone .....	Jamesburg .....	56	44	2.41	1.65	23.96	22.90
	Middlesex Fertilizer Co., Plainfield, N. J.							
160522	Glaser's Pure Ground Bone .....	Plainfield .....	22	78	3.16	2.46	25.54	20.00
	Monmouth County Farmers' Exchange, Freehold, N. J.							
160086	Ground Bone .....	Freehold .....	54	46	2.11	1.64	21.58	22.00
	O. F. Neidt & Sons Co., Trenton, N. J.							
160115	Ground Bone .....	Trenton .....	55	45	2.51	....	20.96	....
	Nitrate Agencies Co., New York City.							
16496	Ground Bone .....	New Brunswick .....	70	30	2.62	2.46	23.38	22.88
	Ruckman Bros., New Brunswick, N. J.							
160480	Ground Bone .....	New Brunswick .....	55	45	2.27	2.47	20.88	20.00
	Sea Board Utilization Co., Long Branch, N. J.							
16811	Raw Bone Meal .....	Long Branch .....	22	78	3.30	....	17.04	....
	M. L. Shoemaker & Co., Ltd., Philadelphia, Pa.							
16123	Swift-Sure Bone Meal .....	Moorestown .....	60	40	4.92	4.53	24.74	20.00
16535	Pure Raw Bone Meal .....	Vineland .....	59	41	3.15	3.30	27.76	20.00
	Standard Guano Co., Baltimore, Md.							
16120	Ground Bone .....	Moorestown .....	51	49	3.47	....	21.16	....
	Swift & Co., Baltimore, Md.							
16991	Swift's Pure Bone Meal .....	Red Bank .....	81	19	2.39	2.47	29.40	24.00
	Swift & Co., Kearny, N. J.							
16910	Swift's Pure Degelatinized Bone .....	New Lisbon .....	67	33	1.64	0.82	26.36	28.00
160432	Swift's Pure Bone Meal .....	Neshanic .....	60	40	2.39	2.47	24.60	24.00
160570	Swift's Pure Raw Bone Meal .....	Nutley .....	20	80	3.47	3.70	21.54	23.00
	Geo. F. Taylor Commission Co., New York City.							
16868	Ground Bone .....	Keyport .....	55	45	3.90	....	22.88	....
	I. P. Thomas & Son Co., Philadelphia, Pa.							
16539	Pure Ground Animal Bone .....	Vineland .....	48	52	3.95	3.70	24.88	23.00
160419	Pure Ground Bone .....	Barbertown .....	51	49	2.31	2.46	25.56	23.00
	Trenton Bone Fertilizer Co., Trenton, N. J.							
16961	Pure Fine Ground Bone .....	Beverly .....	65	35	3.42	3.28	25.04	23.00
	F. W. Tunnell & Co., Inc., Philadelphia, Pa.							
160030	Pure Ground Bone .....	Edgewater Park .....	52	48	0.82	2.49	29.76	23.00
160171	Bone Dust .....	Princeton Junction...	61	39	1.82	1.64	15.94	13.50

## GROUND BONE—(Continued)

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED	Finer than 1/50 inch.	Coarser than 1/50 inch	NITROGEN		PHOSPHORIC ACID	
					Found	Guaranteed	Found	Guaranteed
160632	Virginia-Carolina Chemical Co., New York City. V. C. C. Co.'s Bone Meal .....	Martinsville .....	66	34	2.58	2.47	22.64	22.00
16353	Emil Wahl Mfg. Co., Philadelphia, Pa. Warranted Pure Button Bone Meal .....				2.46	3.30	23.64	24.59
16500	West Jersey Marl and Trans. Co., Woodbury, N. J. • Pure Bone Meal .....	Fairton .....	60	40	3.67	3.70	21.20	21.50
16546	Wm. Wilde, Vineland, N. J. Ground Bone .....	Vineland .....	50	50	2.27	2.47	17.20	15.00
16547	Steamed Bone .....	Vineland .....	58	42	1.93	2.06	28.48	22.00
16694	Winterbottom, Carter & Co., Egg Harbor, N. J. Pure Bone Dust .....	Egg Harbor .....	77	23	3.86	3.87	26.44	26.72

## SUNDRY MATERIALS

16017. Treated Feldspar. Sample was submitted by Dr. Chas. F. Jones, Elizabeth, N. J., and it was claimed that the potash content was soluble in a dilute solution of a weak acid, but no claim was made for the potash being in the water-soluble form. The sample contained 5.20 per cent of potash, all of which was soluble in a 1 per cent solution of citric acid. There was no water-soluble potash present.

16019. Muck. Submitted by H. H. Hance, Hackettstown, N. J. It contained 42.64 per cent of water; 0.41 per cent of nitrogen; a trace of phosphoric acid, and 0.10 per cent of potash.

16029 and 16030. Marls. Samples were submitted by J. F. Ayres, Alloway, N. J. Sample 16029 contained: lime 20.24 per cent; phosphoric acid 0.44 per cent, and a trace of potash. Sample 16030 contained: lime 24.43 per cent; phosphoric acid 0.30 per cent, and a trace of potash.

16031. Ashes. Submitted by E. J. Hoppen, Newark, N. J. It contained 3.48 per cent of lime; 1.53 per cent of phosphoric acid, and 0.08 per cent of potash.

16044. Wood Ashes. Submitted by Elmer Bowe, Newport, N. J. It was claimed to contain 5.50 per cent of potash. It contained 56.96 per cent of lime; 0.17 per cent of phosphoric acid, and 0.48 per cent of potash.

16048. Wood Ashes. Submitted by Morris Feinstein, Bridgeton, N. J. This sample contained 55.97 per cent of lime; 0.26 per cent of phosphoric acid, and 0.45 per cent of potash.

Information was received that the above samples, Nos. 16044 and 16048, represented material that was being sold in the southern section of this state for about \$19.00 per ton. An inspector was immediately sent to investigate and to collect official samples of the material. In accordance with the instructions, information was secured that W. H. Leidy, Swarthmore, Pa., was selling the material and two official samples were secured.

Sample 16442 was taken from the stock of I. Serata & Sons, Bridgeton, N. J., and it contained 57.14 per cent of lime; 0.15 per cent of phosphoric acid, and 0.17 per cent of potash. The second sample, No. 16448, was taken from the stock of James Davis, Bridgeton, N. J., and it contained 56.10 per cent of lime; 0.15 per cent of phosphoric acid, and 0.24 per cent of potash.

All of the results show that the material was only a little better than a good grade of limestone. All of the parties known to be interested were notified of the condition and the sellers were advised

to withdraw the material from our markets. The county demonstrator was also given the information in order that he might advise the farmers in his section regarding the value of the material. At a later date it was impossible to secure any evidence that additional shipments of the material had been received.

16045. Marl. Submitted by South Jersey Farmers' Exchange, Woodstown, N. J. It contained 1.55 per cent of phosphoric acid and 5.33 per cent of total potash.

16096. Phosphate Rock. Sold under brand name of "Daybreak Tennessee Brown Phosphate Rock" by Federal Chemical Co., Louisville, Ky. Sampled from the stock of Monmouth County Farmers' Exchange, Freehold, N. J.

16912: Phosphate Rock. Sold under the same brand name and by the same company as noted for Sample 16096. This sample represented the stock of J. White, New Lisbon, N. J.

	Total Phosphoric Acid	
	Found %	Guaranteed %
Sample No. 16096 .....	30.92	29.75
Sample No. 16912 .....	26.86	29.75

16194. Sewage Sludge. The sample was marked from "Millville Sewage Beds" and was submitted by F. G. Merithew, Vineland, N. J. It contained 69.37 per cent of water; 0.70 per cent of nitrogen; 0.33 per cent of phosphoric acid, and a trace of potash.

16242. Scotch Soot. Submitted by Prof. M. A. Blake, New Brunswick, N. J.

16243. Soft Coal Soot. Submitted by Prof. M. A. Blake, New Brunswick, N. J.

16244. Hard Coal Soot. Submitted by Prof. M. A. Blake, New Brunswick, N. J.

16245. Soot from Short Course Greenhouses. Submitted by Prof. M. A. Blake, New Brunswick, N. J.

	16242	16243	16244	16245
	%	%	%	%
Nitrogen as ammonia salts ....	1.48	0.02	0.93	1.38
Nitrogen as organic .....	1.19	0.90	0.51	0.91
Nitrogen as total .....	2.67	0.92	1.44	2.29
Phosphoric acid .....	0.27	0.68	1.18	0.67
Potash .....	0.09	0.13	0.21	0.28

16293. Wool Waste. Submitted by Fred Sleeter, Laurel Springs, N. J. It contained 30.66 per cent of water; 1.52 per cent of nitro-

gen; 0.26 per cent of phosphoric acid; 1.75 per cent of total potash, 0.83 per cent being in a water-soluble form.

16330. Wood Ashes. Submitted by A. Hummer, East Millstone, N. J. It contained 25.38 per cent of lime; 1.22 per cent of phosphoric acid, and 2.24 per cent of potash.

16331. Press Cake. Submitted by Southern Cotton Oil Co., Bayonne, N. J. It contained 43.66 per cent of water; 4.44 per cent of phosphoric acid; 0.27 per cent of potash, and 14.83 per cent of lime.

16412. King Crab. Material was sold by F. W. Tunnell & Co., Inc., Philadelphia, Pa., and sample represented the stock of J. C. Heritage, Mickleton, N. J. It contained 8.69 per cent of nitrogen and 2.57 per cent of phosphoric acid.

16655. Wood Ashes. Sold by John Joynt, Lucknow, Canada, and represented stock of W. H. Parkhurst, Hammonton, N. J. It contained 28.71 per cent of lime; 1.55 per cent of phosphoric acid, and 2.36 per cent of potash. It was guaranteed to contain 1 per cent of phosphoric acid and 1 per cent of potash.

160113. Bone and Tankage. Represented stock of O. F. Niedt Sons Co., Trenton, N. J. Material was in a poor mechanical condition. It contained 4.28 per cent of nitrogen and 15.20 per cent of phosphoric acid.

160114. Tankage. Represented stock of O. F. Niedt Sons Co., Trenton, N. J. Material was in poor mechanical condition. It contained 6.14 per cent of nitrogen and 6.36 per cent of phosphoric acid.

160148. Bone and Tankage. Represented stock of Bennett & Bennett, Prospect Plains, N. J., and was sold by Trenton Bone Fertilizer Co., Trenton, N. J. The material was guaranteed to contain 2.06 per cent of nitrogen and 9 per cent of phosphoric acid. The results of the analysis were 2.11 per cent of nitrogen and 14.31 per cent of phosphoric acid.

160294. Poudrette. Submitted by Claude N. Terry, Dividing Creek, N. J. It contained 1.52 per cent of nitrogen; 4.14 per cent of total phosphoric acid, and 3.80 per cent of available phosphoric acid.

160295. Meadow Sod Ashes. Submitted by Isaac Steelman, Northfield, N. J. It contained 0.31 per cent of phosphoric acid and 0.22 per cent of potash.

160386. Cyanamid. Sold by I. P. Thomas & Son Co., Philadelphia, Pa., and represented stock of E. N. Strong, Ringoes, N. J. It was guaranteed to contain 20.1 per cent of nitrogen and it contained 19.95 per cent of this element.

160479. Bone and Tankage. Represented stock that was being

sold by S. Lederer & Son, New Brunswick, N. J. 'It was guaranteed to contain 3.50 per cent of nitrogen and 10 per cent of phosphoric acid. The sample contained 3.01 per cent of nitrogen and 9.17 per cent of phosphoric acid.

160561. Wood Ashes. Official sample of material being sold by Bon Arbor Chemical Co., Paterson, N. J. It was guaranteed to contain 1 per cent of phosphoric acid and 3 per cent of potash. The results of the analysis were: phosphoric acid 1.50 per cent; potash 4.76 per cent, and lime 23.12 per cent.

160600. Acetylene Gas Tank Refuse. Submitted by Clifford Nevius, Monmouth Junction, N. J. It contained 18.94 per cent of water; 47.34 per cent of lime, and a trace of magnesia; 9.95 per cent of lime was in the form of carbonate.

160605. Dry Sludge. Submitted by Collingswood Sewage Co., Collingswood, N. J. It contained 39.57 per cent of water; 2.16 per cent of nitrogen, and 0.53 per cent of phosphoric acid.

160631. Slag Sand. Submitted by R. Corbett, Rahway, N. J. It contained 32.23 per cent of lime and 0.15 per cent of phosphoric acid.

160611. Nebraska Potash Salt. Submitted by South Jersey Farmers' Exchange, Woodstown, N. J. It was guaranteed to contain 27 per cent of water-soluble potash, and the actual content was 27.22 per cent.

160620. Sulphate of Potash. Submitted by South Jersey Farmers' Exchange, Woodstown, N. J., and represented the material prepared from alunite. It contained 45.55 per cent of water-soluble potash.

### AGRICULTURAL LIME

The law entitled "An Act to Regulate the Sale of Agricultural Lime" became effective on January 1, 1914. The essential features of this law, briefly stated, are:

1. Registration of the brand name and guarantees that will be attached to the materials as sold.
2. The constituents that must be guaranteed.
3. The name and address of the party responsible for the material.
4. The official inspection of the materials offered for sale.

### REGISTRATIONS

During the past year 43 manufacturers registered 87 different brands of agricultural lime. The names and addresses of those who have registered their products are:

Acme Stone & Pulverizing Co.....	Lebanon, Pa.
American Agricultural Chemical Co.....	New York City.
J. E. Baker Co.....	York, Pa.
S. W. Barrick & Sons.....	Woodsboro, Md.
Beam & Co.....	Philadelphia, Pa.
Blair Limestone Co.....	Martinsburg, W. Va.
Carbo Agricultural Lime Co.....	Wilmington, Del.
The Charite Co., Inc.....	Andover, N. J.
F. E. Conley Stone Co.....	Utica, N. Y.
Judson Conover.....	Matawan, N. J.
G. & W. H. Corson.....	Plymouth Meeting, Pa.
Edison Pulverized Limestone Co.....	New Village, N. J.
J. Philip Exton.....	Clinton, N. J.
The Fountain Rock Lime Co.....	Woodsboro, Md.
Godfrey Co-operative Fertilizer & Chemical Co.....	Newark, N. J.
M. J. Grove Lime Co.....	Lime Kiln, Md.
James Heritage & Son.....	Vineland, N. J.
Winfield S. Hoffman.....	Middle Valley, N. J.
International Agricultural Corporation.....	Caledonia, N. Y.
Keasbey & Mattison Co.....	Ambler, Pa.
J. B. King & Co.....	New York City.
Knickerbocker Lime Co.....	Philadelphia, Pa.
John Kreutz & Sons, Inc.....	Philadelphia, Pa.
E. J. Lavino & Co.....	Philadelphia, Pa.
LeGore Combination Lime Co.....	LeGore, Md.
Weller C. Leigh.....	Lebanon, N. J.
Merion Lime & Stone Co.....	Norristown, Pa.
M. C. Mulligan & Son.....	Clinton, N. J.
E. J. Neighbour.....	German Valley, N. J.
Palmer Lime & Cement Co.....	New York City.
Lowell M. Palmer.....	York, Pa.
Philadelphia Lime Co., Inc.....	Philadelphia, Pa.
Security Cement & Lime Co.....	Hagerstown, Md.
The Standard Lime & Stone Co.....	Baltimore, Md.
The Standard Lime & Stone Co.....	Buckeyestown, Md.
Steady & Wilton Co.....	Wrightsville, Pa.
Thomasville Stone & Lime Co.....	Thomasville, Pa.
Tidewater Portland Cement Co.....	Baltimore, Md.
Todd & Cordes.....	Peapack, N. J.
Twining & Large.....	Yardley, Pa.
Vanderhoof Lime Co.....	Hamburg, N. J.
Charles Warner Co.....	Wilmington, Del.
Whitemarsh Lime Works.....	Philadelphia, Pa.

### THE GUARANTEED COMPOSITION

The law states the specific form which must be used in stating the guaranteed composition of the various forms of lime and consists of:

1. The minimum and maximum percentage of total lime.
2. The minimum and maximum percentage of total magnesia.
3. The minimum percentage of lime and magnesia combined as carbonates.

During the past there has been more or less confusion caused by a misunderstanding as to the meaning of the guarantees required. The term "total lime" means total calcium oxide (CaO). The term "total magnesia" means total magnesium oxide (MgO). The term "lime and magnesia combined as carbonates" means the total amount

of calcium and magnesium oxides present in the material that is combined with carbonic acid and is ascertained by determining the percentage of carbonic acid. It does not mean the total lime ( $\text{CaO}$ ) and the total magnesia ( $\text{MgO}$ ) calculated to their equivalents expressed as carbonate of lime.

Since the value of a lime product depends upon the total lime and magnesia present, the value of the first and second guarantees is apparent. The value of the third guarantee when given with the first and second, is in the statement which shows whether the content of the active constituents is in the form as found in a limestone or in the form of a burned lime.

Limestones are variable in composition, some containing only lime in the form of carbonate of lime in addition to the usual impurities, while others contain carbonate of lime and carbonate of magnesia. In both classes the active constituents are in the form of carbonates.

Freshly burned lime does not contain a very large quantity of carbonic acid if the burning has been carefully regulated. The burned lime, however, absorbs carbonic acid from the air and in time it is possible that all of the lime present will be in the same form as in the original limestone.

The interpretation of a guarantee may be more clearly explained by the use of two typical guarantees. Let it be assumed that the following information is attached to materials that are offered:

	Brand No. 1 %	Brand No. 2 %
Total lime .....	29 to 31	53 to 55
Total magnesia .....	17 to 19	37 to 39
Lime and magnesia combined as carbonates.....	46	2

A glance at the guarantee of Brand No. 1 will show that the minimum content of lime and magnesia is 46 per cent. Without any other information these figures might be caused by the material being of low grade, but the third guarantee informs us that all of the lime and magnesia is in the form of carbonate and as such is a good representative of its class. The material, consequently, has the same value as a ground limestone of the same composition and mechanical condition. Brand No. 2, represents a good burned lime since the guarantees show at least 90 per cent of lime and magnesia and only a comparatively small quantity of carbonates.

#### INSPECTION

During the past season 35 samples of various lime products were received and examined. The results of these examinations are given in the following tabulations.

## LIME

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED	Total Lime		Total Magnesia		Lime and Magnesia in the form of Carbonates	
			Found	Guaranteed	Found	Guaranteed	Found	Guaranteed
16093	American Lime Co., Plymouth Meeting, Pa. Plymouth Agricultural Lime	Freehold .....	47.39	39-50	4.41	3-12	44.07	....
16064	Annville Lime Co., Annville, Pa. Snowflake Brand—Hydrated Lime	Princeton Junction...	62.48	55-43	7.47	4.41-8.12	10.92	....
160059	S. W. Barrick & Sons, Woodsboro, Md. Ground Agricultural Lime	Jamesburg .....	69.43	85-90	2.61	2-5	4.35	....
160001	Judson Conover, Matawan, N. J. Oyster Shell Lime	New Monmouth .....	57.62	58-60	Tr.	....	19.05	47.00
160603	G. and W. H. Corson, Plymouth Meeting, Pa. Corson's Prepared Lime (Hydrated)	Princeton Junction...	43.59	42-47	31.71	27-30	8.86	....
160558	M. J. Grove Lime Co., Lime Kiln, Md. *Lump Lime	Swedesboro .....	98.38	50-90	0.80	1-50	1.02	....
16536	Jas. Heritage & Son, Vineland, N. J. Oyster Shell Lime	Vineland .....	58.08	50-60	0.50	Tr.	4.94	16.04
160198	International Agricultural Corporation, Caledonia, N. Y. Lime Carbonate	Pennington .....	48.73	50	....	....	48.73	....
16357	Keasbey & Mattison Co., Ambler, Pa. Agricultural Lime	Moorestown .....	44.73	38-50	5.56	4-12	43.20	....
16443	Agricultural Lime	Cranbury .....	37.20	38-50	5.93	4-12	36.44	....
16169	Legore Combination Lime Co., Legore, Md. Refined Hydrated Lime	Quinton .....	57.64	50	4.99	....	4.95	....
16839	* Refined Hydrated Lime	Wrightstown .....	52.81	....	8.00	....	7.84	....
16554	L. M. Palmer, York, Pa. Challenge Brand Hydrated Lime	Mullica Hill .....	70.11	70	2.26	3	3.03	....

\* Unofficial sample.

## LIME—(Continued)

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED	Total Lime		Total Magnesia		Lime and Magnesia in the form of Carbohydrates	
			Found	Guaranteed	Found	Guaranteed	Found	Guaranteed
16969	Philadelphia Lime Co., Inc., Philadelphia, Pa. Hydrated Lime .....	Burlington .....	43.38	45-50	3.91	4-7	39.77	.....
16584	Standard Lime & Stone Co., Buckeystown, Md. Standard Hydrated Lime .....	Swedesboro .....	69.56	70	1.78	.....	1.64	.....
16262	Stacy & Wilton Co., Wrightsville, Pa. Sterling Brand Hydrated Lime .....	Sewell .....	66.88	65-72	4.57	2-8	2.48	1-5
160608	Tidewater Portland Cement Co., Baltimore, Md. Tidewater Hydrated Lime .....	Freehold .....	73.29	71-76	0.83	0.5-1.75	1.30	0-2
160617	Vanderhoof Lime Co., Hamburg, N. J. *Fresh Burnt Agricultural Lump Lime .....	New Brunswick .....	82.71	.....	9.50	.....	0.17	.....
16301	Chas. Warner Co., Wilmington, Del. Pulverized Burnt Lime .....	Grenloch .....	56.35	53.1-55	39.28	37.4-39	2.55	3.00
16595	Pulverized Burnt Lime .....	Woodbury .....	55.05	53.1-55	38.52	37.4-39	0.30	3.00
16604	Cedar Hollow Limoid—Hydrated Lime .....	Millville .....	47.11	47-50	32.47	31-33	0.92	2.00
16856	Cedar Hollow Limoid—Hydrated Lime .....	Medford .....	47.68	47-50	33.91	31-33	0.84	2.00

\* Unofficial sample.

# LIMESTONE

Station Number	MANUFACTURER AND BRAND	WHERE SAMPLED	Total Lime		Total Magnesia		Lime and Magnesia in the form of Carbonates	
			Found	Guaranteed	Found	Guaranteed	Found	Guaranteed
160621	Beaver Dam Marble Co., Baltimore, Md. *Ground Limestone	Mt. Holly	28.90	.....	20.30	.....	49.20	.....
16270	F. E. Conley Stone Co., Utica, N. Y. *Raw Ground Lime	Mt. Holly	51.20	.....	0.47	.....	51.67	.....
16007	Todd Cordes, Peapack, N. J. *Ground Limestone	Peapack	29.99	.....	21.02	.....	51.01	.....
160143	Edison Pulverizing Limestone Co., New Village, N. J. Edison's Pulverized Limestone	Monmouth Junction	49.18	.....	1.25	.....	50.43	.....
160631	N. G. Farber, Hamburg, N. J. *Limestone	Hamburg	30.64	.....	20.65	.....	51.29	.....
160484	Godfrey Co-operative Fert. and Chem. Co., Newark, N. J. Pulverized Limestone	New Brunswick	50.97	.....	1.44	.....	52.41	.....
16485	Knickerhocker Lime Co., Philadelphia, Pa. Ground Limestone	Thorofare	27.45	.....	19.19	.....	46.64	.....
160074	E. J. Lavino & Co., Philadelphia, Pa. White Marsh Pulverized Limestone	Marlboro	30.08	25-32	20.78	18-22	50.86	.....
16930	Wm. Scott, Newton, N. J. *Ground Limestone	Newton	26.44	.....	15.95	.....	42.39	.....
16585	Standard Lime & Stone Co., Buckeystown, Md. Standard Ground Limestone	Swedesboro	53.30	.....	0.91	.....	54.21	.....
16777	Steady and Wilton Co., Wrightsville, Pa. Pulverized Limestone	Farmingdale	51.17	50	2.96	.....	54.13	.....
16719	Chas. Warner Co., Wilmington, Del. *Cedar Hollow Ground Limestone	New Brunswick	29.70	.....	21.32	.....	51.02	.....
160083	Pulverized Limestone	Freehold	27.78	29-31	18.65	19-21	46.43	.....

\* Unofficial sample.

BRANDS REGISTERED SINCE JANUARY 18 FOR THE FISCAL YEAR  
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## GUARANTEED MINIMUM ANALYSIS

	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
Acme Guano Co., Baltimore, Md.					
Special Ammoniated Mixture .....	0.82	1.00	.....	8.00	.....
Harvest King No. 2 .....	0.82	1.00	.....	10.00	.....
Special Harvest King .....	0.82	1.00	.....	10.00	2.00
Ideal .....	1.64	2.00	.....	8.00	1.00
Special Sweet Potato No. 2 .....	1.64	2.00	.....	8.00	2.00
Ammoniated Fish .....	2.46	3.00	.....	8.00	1.00
Fish Mixture No. 2 .....	2.46	3.00	.....	8.00	2.00
Potato Climax No. 2 .....	3.28	4.00	.....	8.00	2.00
Acme Early Truck No. 2 .....	4.10	5.00	.....	7.00	2.00
American Agricultural Chemical Co., New York City.					
Dry Ground Fish .....	8.23	10.00	.....	.....	.....
High Grade Dried Blood .....	9.87	12.00	.....	.....	.....
Nitrate of Soda .....	15.00	18.23	.....	.....	.....
Sulphate of Ammonia .....	20.16	24.50	.....	.....	.....
Fine Ground Bone .....	2.47	3.00	22.88	.....	.....
High Grade Ground Bone .....	3.29	4.00	20.59	.....	.....
Mass. Ground Raw Bone .....	3.91	4.75	26.62	.....	.....
Ground Tankage (6 & 30) .....	4.94	6.00	13.73	.....	.....
Ground Tankage (9 & 20) .....	7.41	9.00	9.15	.....	.....
Ground Untreated Phosphate Rock .....	.....	.....	31.12	.....	.....
Basic Lime Phosphate .....	.....	.....	14.00	13.00	.....
Soluble Grain Mixture .....	0.82	1.00	9.00	8.00	.....
Dissolved Animal Bone .....	2.06	2.50	13.00	12.00	.....
Superphosphate with Ammonia 4% .....	3.29	4.00	9.00	8.00	.....
Sterling Truck and Top Dressing Mixture.....	6.58	8.00	9.00	8.00	.....
Universal Grain Grower .....	0.82	1.00	9.00	8.00	2.00
Grain Grower No. 3 .....	1.65	2.00	10.00	9.00	1.00
American Fertilizing Co., Baltimore, Md.					
Hackett's Special Potato Grower .....	3.29	4.00	9.00	8.00	2.00
American Potato Superphosphate .....	4.12	5.00	11.00	10.00	.....
William B. Apgar, Three Bridges, N. J.					
Apgar's Standard Grain Fertilizer .....	1.65	2.00	8.00	8.00	3.00
Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.					
Special Mixtures in accordance with ruling of State Chemist.					
Harvest Queen No. 2 .....	1.23	1.50	9.50	9.00	.....
Armour's 2-8-0 .....	1.65	2.00	8.50	8.00	.....
Rooney's Special Grain Grower .....	1.65	2.00	11.50	11.00	.....
Sweet Potato No. 2 .....	1.65	2.00	11.50	11.00	.....
Organic Guano .....	2.25	2.73	5.50	4.62	.....
Armour's 3-8-0 .....	2.47	3.00	8.50	8.00	.....
Blood and Meat Substitute .....	2.47	3.00	10.50	10.00	.....
Corn Fertilizer No. 2 .....	2.90	3.53	11.00	9.00	.....
Armour's 4-8-0 .....	3.29	4.00	8.50	8.00	.....

BRANDS REGISTERED SINCE JANUARY 18 FOR THE FISCAL YEAR  
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	GUARANTEED MINIMUM ANALYSIS				
	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
Armour Fertilizer Works, Baltimore, Md., and Chrome, N. J.—(Cont.)					
Armour's 4-10-0 .....	3.29	4.00	10.50	10.00	.....
General Truck Fertilizer No. 2 .....	5.60	6.81	10.00	7.00	.....
Potato Fertilizer No. 2 .....	5.76	7.00	8.00	7.52	.....
Top Dresser .....	8.00	9.73	7.50	4.00	.....
Sterling Potato No. 2 .....	0.82	1.00	7.50	7.00	1.00
Oats and Peas Fertilizer .....	1.65	2.00	10.50	10.00	3.00
Late Potato Fertilizer .....	1.65	2.00	10.50	10.00	3.00
Corn Fertilizer .....	2.47	3.00	9.50	9.00	3.00
Wheat Fertilizer .....	2.47	3.00	12.50	12.00	3.00
Early Potato Fertilizer .....	3.29	4.00	9.50	9.00	3.00
Truck Fertilizer .....	6.58	8.00	9.50	9.00	3.00
Top Dressing .....	12.34	15.00	6.50	6.00	3.00
Atlantic Fertilizer Works, Baltimore, Md.					
Atlantic Four, Ten, Naught Brand .....	3.29	4.00	10.00	10.00	.....
Atlantic Four Ten, One Brand .....	3.29	4.00	10.00	10.00	1.00
James H. Baird & Son, Marlboro, N. J.					
Tankage .....	8.18	9.95	.....	.....	.....
Dried Blood .....	13.33	16.19	.....	.....	.....
Bone Meal .....	2.47	3.00	22.50	.....	.....
5-9-0 .....	4.12	5.00	11.00	9.00	.....
Baird's Special Mixture No. 1 .....	6.77	8.23	6.00	5.00	.....
Baugh & Sons Company, Philadelphia, Pa.					
High Grade Tankage .....	4.94	6.00	3.00	.....	.....
High Grade Tankage .....	5.76	7.00	3.50	.....	.....
Baugh's High Grade Tankage .....	8.23	10.00	5.00	.....	.....
Baugh's High Grade Potato Grower, 1916, without Potash .....	3.30	4.00	8.00	8.00	.....
Baugh's Fish, Bone and Potash, 1916, without Potash .....	3.30	4.00	10.00	10.00	.....
Baugh's Peruvian Guano Substitute, 1916, without Potash, for Potatoes and All Vegetables .....	4.12	5.00	8.00	8.00	.....
Baugh's Superb Potato Phosphate, 1916, without Potash .....	4.12	5.00	10.00	10.00	.....
Baugh's Superlative Truck Grower, 1916, without Potash .....	5.76	7.00	8.00	8.00	.....
Bennett & Bennett, Prospect Plains, N. J.					
Bennett's Special .....	3.29	4.00	11.00	10.00	.....
The Biological Chemical Co., Bloomfield, N. J.					
Phosphogerm .....	1.00	1.20	12.00	.....	.....
Elmer Bowe, Newport, N. J.					
Poudrette .....	1.36	1.65	3.95	3.30	.....
Bowker Fertilizer Co., New York City.					
Bowker's Fresh Ground Bone .....	2.47	3.00	22.88	.....	.....
Bowker's High Nitrogen Mixture, without Potash.	8.23	10.00	6.00	5.00	.....
Bowker's Ammoniated Food for Flowers .....	2.47	3.00	7.00	6.00	2.00

BRANDS REGISTERED SINCE JANUARY 18 FOR THE FISCAL YEAR  
ENDING OCTOBER 31, 1916

	GUARANTEED MINIMUM ANALYSIS				
	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
<b>Bowker Fertilizer Co., New York City.—(Cont.)</b>					
Bowker's Lawn and Garden Dressing, 1916.....	4.11	5.00	9.00	8.00	1.00
<b>William M. Brown, Cedarville, N. J.</b>					
Brown's 2-8-2 .....	1.65	2.00	8.50	8.00	2.00
Brown's 4-8-2 .....	3.25	4.00	8.50	8.00	2.00
Brown's Fish Guano .....	4.10	5.00	10.50	10.00	.....
<b>Burlington Co. Produce Sales Co., Mt. Holly, N. J.</b>					
Holly Special Corn Grower .....	1.65	2.00	10.00	10.00	.....
Holly Special Diamond A Fertilizer .....	2.47	3.00	8.00	8.00	.....
Holly Favorite .....	4.11	5.00	10.00	10.00	.....
<b>Burlington Supply Co., Burlington, N. J.</b>					
B. S. C. Pea and Bean Manure .....	1.64	2.00	11.00	10.00	.....
B. S. C. Special Truck Manure .....	3.28	4.00	9.00	8.00	.....
<b>Chamberlin &amp; Barclay, Cranbury, N. J.</b>					
1916 Special Top Dressing .....	7.00	8.00	8.00	5.25	.....
<b>The Coe-Mortimer Co., New York City.</b>					
High Grade Dried Blood .....	9.87	12.00	.....	.....	.....
Nitrate of Soda .....	15.00	18.23	.....	.....	.....
Fine Ground Bone .....	2.47	3.00	22.88	.....	.....
Ground Tankage, 6 & 30 .....	4.94	6.00	13.73	.....	.....
E. Frank Coe's Basic Fruit and Legume Phosphate (Basic Lime Phosphate). Key-Plow Brand) .....	.....	.....	14.00	13.00	.....
Dissolved Animal Bone .....	2.06	2.50	13.00	12.00	.....
Country Club (Reg. U. S. Pat. Off.) Polo Field Special .....	6.58	8.00	7.00	6.00	.....
E. Frank Coe's Morco Top Dresser, without Potash .....	8.23	10.00	6.00	5.00	.....
Country Club (Reg. U. S. Pat. Off.) Golf and Lawn Fertilizer 1916, Brand B. for Fair Greens .....	4.53	5.50	4.00	3.00	1.00
Country Club (Reg. U. S. Pat. Off.) Golf and Lawn Fertilizer 1916, Brand A. for Putting Greens .....	5.76	7.00	4.00	3.00	1.00
<b>J. S. Collins &amp; Son, Inc., Moorestown, N. J.</b>					
Nitrate of Soda .....	15.26	18.50	.....	.....	.....
Ground Steamed Bone .....	3.26	4.00	12.00	11.00	.....
Dried and Ground Fish .....	9.46	11.50	7.78	6.78	.....
<b>Dairy Phospho Plaster Co., Philadelphia, Pa.</b>					
Dairy Phospho Plaster .....	.....	.....	10.00	.....	.....
<b>R. T. Demaris, Cedarville, N. J.</b>					
Demaris' Bone Complete No. 1, 1916 .....	1.65	2.00	11.00	10.00	.....
Demaris' Fish Guano, 1916 .....	2.47	3.00	11.00	10.00	.....
Demaris' Special Berry Mixture, 1916 .....	4.11	5.00	9.00	8.00	.....
Demaris' Truckers' Pride, 1916 .....	4.11	5.00	9.00	8.00	.....

BRANDS REGISTERED SINCE JANUARY 18 FOR THE FISCAL YEAR  
ENDING OCTOBER 31, 1916

	GUARANTEED MINIMUM ANALYSIS				
	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
<b>E. Dougherty, Philadelphia, Pa.</b>					
Domestic Potash Material .....	.....	.....	.....	.....	25.00
Low Grade Muriate of Potash .....	.....	.....	.....	.....	40.00
<b>James G. Downward Co., Coatesville, Pa.</b>					
1916 Potato, Corn and Grain Special .....	1.65	2.00	9.00	8.00	1.00
1916 Pioneer Potato Manure .....	2.47	3.00	9.00	8.00	1.00
1916 Ammoniated Phosphate .....	0.82	1.00	9.00	8.00	.....
Special Mixture "Top Dresser" .....	4.90	6.00	6.00	5.00	.....
<b>John W. Dunham, Alloway, N. J.</b>					
Dunham's Tankage .....	5.35	6.50	10.00	.....	.....
<b>Farmers' Co-operative Association of Mercer County, Trenton, N. J.</b>					
Farmers' Co-operative 3-11½-0 Corn and Grain Special .....	2.47	3.00	12.00	11.50	.....
Farmers' Co-operative 4-8-0 Special Fertilizer.....	3.29	4.00	8.50	8.00	.....
Farmers' Co-operative 5-8-0 Truck Fertilizer.....	4.11	5.00	8.50	8.00	.....
Farmers' Co-operative 5-10-0 Truck Special.....	4.11	5.00	10.50	10.00	.....
Farmers' Co-operative 8½-8-0 Grass Top Dressing.....	6.99	8.50	8.50	8.00	.....
Farmers' Co-operative 4-8-2 Potato Fertilizer.....	3.29	4.00	8.50	8.00	2.00
Farmers' Co-operative 5-8-2 Potato Fertilizer.....	4.11	5.00	8.50	8.00	2.00
<b>Max Feinstein, Bridgeton, N. J.</b>					
Feinstein's 2-8-3 .....	1.64	2.00	9.00	8.00	3.00
Feinstein's 3-8-3 .....	2.47	3.00	9.00	8.00	3.00
<b>Fogg &amp; Hires Co., Salem, N. J.</b>					
Brand No. 1 1916 for Potatoes and Truck.....	5.76	7.00	12.00	.....	.....
<b>Godfrey Co-operative Fertilizer &amp; Chemical Co., New ark, N. J.</b>					
Godfrey's Potato and Truck Mixture .....	4.11	5.00	10.50	10.00	.....
<b>James C. Griscom, Woodbury, N. J.</b>					
2-10-0 .....	1.65	2.00	11.00	10.00	.....
<b>Peter Henderson &amp; Co., New York City.</b>					
Henderson's Worm Killing Grass Food .....	2.36	2.87	.....	.....	1.80
<b>Hendrickson &amp; Dilatush, Robbinsville, N. J.</b>					
Tankage .....	8.20	10.00	.....	.....	.....
Blood .....	13.12	16.00	.....	.....	.....
Nitrate of Soda .....	14.75	18.00	.....	.....	.....
Sulphate of Ammonia .....	20.50	25.00	.....	.....	.....
Steam Bone .....	2.47	3.00	22.00	.....	.....
Dey's Special .....	1.02	1.25	12.00	10.00	.....
Rye Manure .....	1.02	1.25	12.00	10.00	.....
Grain and Grass Manure No. 2 .....	1.65	2.00	11.00	9.00	.....
Grain Grower .....	1.65	2.00	11.00	9.00	.....
Corn Manure No. 2 .....	1.65	2.00	11.00	9.00	.....
Dissolved Animal Matter .....	1.65	2.00	14.00	12.00	.....
H. G. Wheat and Grass Manure .....	2.47	3.00	11.00	9.00	.....
Corn Broadcaster No. 3 .....	2.87	3.50	11.00	9.00	.....
<b>S. M. Hess &amp; Brother, Inc., Philadelphia, Pa.</b>					
Nitrate of Soda .....	15.00	18.23	.....	.....	.....
Fine Ground Bone .....	2.47	3.00	22.88	.....	.....

BRANDS REGISTERED SINCE JANUARY 18 FOR THE FISCAL YEAR  
ENDING OCTOBER 31, 1916

	GUARANTEED MINIMUM ANALYSIS				
	Nitrogen	Nitrogen-Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
S. M. Hess & Brother, Inc., Philadelphia, Pa.—(Cont.)					
High Grade Ground Bone .....	3.29	4.00	20.59	.....	.....
Special High Grade Acid Phosphate .....	.....	.....	17.00	16.00	.....
Market Gardeners' Manure .....	4.11	5.00	9.00	8.00	.....
High Grade Potato Grower .....	4.11	5.00	11.00	10.00	.....
Top Dressing Manure .....	8.23	10.00	6.00	5.00	.....
Philip Hoffman & Bro., Raubsville, Pa.					
Potato and Truck .....	0.82	1.00	10.00	7.00	1.00
Grain and Corn .....	0.82	1.00	10.00	7.00	1.00
Oats .....	.....	.....	10.00	7.00	1.00
Hubbard Fertilizer Co., Baltimore, Md.					
Hubbard's Import Bone .....	2.46	3.00	20.00	.....	.....
Hubbard's 14% Phosphate .....	.....	.....	15.00	14.00	.....
Hubbard's Excelsior Mixture .....	1.64	2.00	11.00	10.00	.....
Hubbard's Special Ammoniated .....	2.46	3.00	8.75	8.00	.....
Hubbard's 4-10-0 Fertilizer .....	3.28	4.00	11.00	10.00	.....
Hubbard's 5-10-0 Fertilizer .....	4.10	5.00	11.00	10.00	.....
Hubbard's National Favorite .....	3.28	4.00	8.75	8.00	1.00
Hudson Carbon Co., Ballston Spa, N. Y.					
A 1 Manure .....	1.00	1.25	1.00	.....	.....
H. H. Hutchinson, Jr., Robbinsville, N. J.					
Tankage .....	6.58	8.00	.....	8.00	.....
Nitrate of Soda .....	15.50	18.00	.....	.....	.....
Sulphate of Ammonia .....	20.63	25.00	.....	.....	.....
Acid Phosphate .....	.....	.....	15.00	14.00	.....
Hutchinson's Corn and Grain Manure .....	1.65	2.00	8.50	8.00	3.00
Hutchinson's Complete Potato Manure .....	2.47	3.00	8.50	8.00	3.00
Hutchinson's 4-8-2 Potato Fertilizer .....	3.29	4.00	8.50	8.00	2.00
Hyper Humus Co., Newton, N. J.					
Hyper Humus .....	1.33	1.61	.....	.....	.....
H. B. Kemp, Long Branch, N. J.					
Kemp's Garden City Phosphate .....	.....	.....	14.00	14.00	.....
Kemp's Raw Bone Meal .....	3.70	4.50	23.00	.....	.....
Kemp's Grain and Grass Grower .....	1.65	2.00	10.50	10.00	.....
Kemp's Corn and Truck Fertilizer .....	2.47	3.00	10.50	10.00	.....
Kemp's Potato and Vegetable Fertilizer .....	3.29	4.00	10.50	10.00	.....
Kemp's Early Truck Grower .....	4.11	5.00	10.50	10.00	.....
Keystone Bone Fertilizer Co., Philadelphia, Pa.					
1916 Keystone General Crop Fertilizer .....	1.64	2.00	9.00	8.00	.....
Keystone Special Potato and Tomato Mixture....	3.28	4.00	12.00	10.00	.....
Keystone 7% Top Dresser .....	5.80	7.00	9.00	8.00	.....
Kirke Chemical Co., Inc., Brooklyn, N. Y.					
Kirke Fertilizer .....	5.00	6.10	8.25	7.50	3.15
William Lancaster, Philadelphia, Pa.					
Grange A Brand Potato Manure .....	3.30	4.00	9.00	8.00	2.00
Grange B Brand Potato Manure .....	4.12	5.00	11.00	10.00	.....
Grange C Brand Potato Manure .....	2.46	3.00	11.00	10.00	.....
Samuel Lederer & Son, New Brunswick, N. J.					
Nitrate of Soda .....	.....	19.00	.....	.....	.....
Acid Phosphate .....	.....	.....	15.00	14.00	.....

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	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
<b>Samuel Lederer &amp; Son, New Brunswick, N. J.—(Cont.)</b>					
Tankage and Bone .....	2.88	3.50	12.00	10.00	.....
Pure Ground Bone .....	3.29	4.00	14.00	.....	.....
<b>Benjamin Lieber, Atlantic City, N. J.</b>					
Flag Brand Tankage .....	4.04	4.91	17.89	.....	.....
Sew Easy Fertilizer .....	4.49	5.45	17.18	.....	.....
<b>Listers Agricultural Chemical Works, Newark, N. J.</b>					
Listers Bone Meal 1916 .....	2.47	3.00	23.00	.....	.....
Listers Celebrated Ground Bone and Tankage Acidulated .....	2.67	3.25	12.00	.....	.....
Listers 4-8 Fertilizer .....	3.29	4.00	9.00	8.00	.....
Listers Atlas Brand Fertilizer 1916 .....	4.11	5.00	9.00	8.00	.....
Listers Special Potato Fertilizer 1916 .....	4.11	5.00	11.00	10.00	.....
A B Special Fertilizer .....	4.53	5.50	11.00	10.00	.....
Listers Special for Wheat and Rye 1916 .....	0.82	1.00	9.00	8.00	1.00
Listers 1-8-2 Fertilizer .....	0.82	1.00	9.00	8.00	2.00
Listers 2-8-2 Fertilizer .....	1.65	2.00	9.00	8.00	2.00
Listers Brakeley Special Mixture 1916 .....	4.11	5.00	9.00	8.00	1.00
<b>Locke &amp; Black, Swedesboro, N. J.</b>					
High Grade Tankage .....	5.76	7.00	3.50	.....	.....
High Grade Tankage .....	8.23	10.00	5.00	.....	.....
<b>Frederick Ludlam Co., New York City.</b>					
Ludlam's Sickle Fertilizer No. 5, 1916 .....	4.11	5.00	9.00	8.00	.....
<b>Martin Fertilizer Co., Philadelphia, Pa.</b>					
Martin's Ground Fish .....	8.23	10.00	.....	.....	.....
Martin's Dried Blood .....	9.88	12.00	.....	.....	.....
Martin's Two-Twelve .....	1.65	2.00	13.00	12.00	.....
<b>Middlesex Fertilizer Co., Plainfield, N. J.</b>					
Glaser's Pure Ground Bone .....	2.46	3.00	20.61	.....	.....
Glaser's Fertilizer for Corn and Oats .....	1.65	2.00	12.00	8.00	.....
Glaser's Complete for All Crops .....	2.46	3.00	10.00	8.00	.....
Glaser's Grass Grower .....	2.46	3.00	12.00	8.00	.....
Glaser's Potato and Vegetable Fertilizer .....	3.29	4.00	8.00	6.00	.....
<b>Monmouth County Farmers' Exchange, Freehold, N. J.</b>					
Triangle Brand, 2-11-0 .....	1.64	2.00	12.00	11.00	.....
Triangle Brand, 6-10-0 .....	4.94	6.00	11.00	10.00	.....
Triangle Brand, 8-6-0 .....	6.58	8.00	7.00	6.00	.....
Triangle Brand, 1-11-2 .....	0.82	1.00	12.00	11.00	2.00
Triangle Brand, 4-9-5 .....	3.29	4.00	10.00	9.00	5.00
Triangle Brand, 11-5-1 .....	9.00	11.00	6.00	5.00	1.00
<b>Nassau Fertilizer Co., New York City.</b>					
Buckwheat Special .....	0.82	1.00	9.00	8.00	.....
<b>Albert Nelson, Allentown, N. J.</b>					
Corn and Truck Fertilizer .....	1.65	2.00	12.00	11.00	1.00
Nelson's Lawn Fertilizer .....	6.59	8.00	7.00	5.00	.....
Nelson's Special Grass Fertilizer .....	8.24	10.00	6.00	5.00	.....
<b>N. J. Fertilizer &amp; Chemical Co., New York City.</b>					
9 & 20 Tankage .....	7.43	9.00	9.16	.....	.....
Croxton War Special .....	3.30	4.00	8.00	7.00	1.00

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N. J. Fertilizer & Chemical Co., N. Y. City.—(Cont.)					
Croxtan Special Garden Fertilizer .....	3.30	4.00	9.00	8.00	2.00
Croxtan Special Lawn Fertilizer .....	5.00	6.00	9.00	8.00	2.00
New Jersey Rendering Co., Secaucus, N. J.					
Bone Meal .....	3.30	4.00	24.00	5.50	.....
Patapsco Guano Co., Baltimore, Md.					
Farmers' Delight .....	0.82	1.00	9.00	8.00	.....
Philadelphia Guano Works, Philadelphia, Pa.					
Six per cent Tankage .....	4.94	6.00	.....	.....	.....
Raw Bone .....	3.30	4.00	20.00	.....	.....
1916 No. 2 Sweet Potato Manure .....	0.82	1.00	10.00	9.00	.....
Homestead Potato Manure .....	4.40	5.00	11.00	10.00	.....
1916 Fall Grain Grower .....	0.82	1.00	9.00	8.00	2.00
1916 Sweet Potato Manure .....	1.64	2.00	9.00	8.00	2.00
Rasin Monumental Co., Baltimore, Md.					
Rasin's Standard Tomato Grower Revised.....	0.82	1.00	9.00	8.00	2.00
Rasin's Sweet Potato and Vegetable Manure.....	1.65	2.00	9.00	8.00	2.00
Reading Bone Fertilizer Co., Reading, Pa.					
Special Mixture, 10% Ammonia .....	8.22	10.00	.....	.....	.....
Reading Sterling Potato Grower .....	3.29	4.00	9.00	8.00	.....
Special Mixture, 6 & 12 .....	4.93	6.00	13.00	12.00	.....
Robert A. Reichard, Allentown, Pa.					
Acid Phosphate .....	.....	.....	15.00	14.00	.....
Steamed Bone Meal .....	2.88	3.50	22.00	.....	.....
Raw Bone Meal .....	3.70	4.50	23.00	.....	.....
American Eagle .....	1.64	2.00	10.00	9.00	.....
Farmers' Choice .....	0.82	1.00	8.00	7.00	1.00
Gilt Edge Phosphate .....	0.82	1.00	9.00	8.00	1.50
Surpass Phosphate .....	1.64	2.00	10.00	8.00	2.00
Special Manure .....	3.28	4.00	7.00	6.00	2.00
Ellwood Roberts Co., Philadelphia, Pa.					
Roberts Nitrate of Soda .....	14.80	18.00	.....	.....	.....
Roberts Basic Slag .....	.....	.....	15.00	.....	.....
Roberts Acid Phosphate, 14% .....	.....	.....	14.00	14.00	.....
Roberts Acid Phosphate, 16% .....	.....	.....	16.00	16.00	.....
Roberts Bone Meal .....	2.46	3.00	22.00	.....	.....
Roberts Raw Bone Meal .....	3.69	4.50	22.00	.....	.....
Roberts Fish Mixture .....	4.10	5.00	22.00	.....	.....
Roberts Ground Tankage .....	4.92	6.00	9.00	.....	.....
Roberts Berry Goods .....	8.20	10.00	6.80	.....	.....
Roberts Dried Ground Fish .....	8.20	10.00	6.80	.....	.....
Roberts Corn Goods .....	1.64	2.00	8.00	8.00	.....
Roberts Top Dresser .....	3.28	4.00	8.00	8.00	.....
Roberts Tomato Goods .....	3.28	4.00	8.00	8.00	1.00
Roberts Potato Goods .....	3.28	4.00	8.00	8.00	1.00
F. S. Royster Guano Co., Baltimore, Md.					
Royster's 14% Acid Phosphate .....	.....	.....	14.50	14.00	.....
Royster's H. G. 16% Acid Phosphate .....	.....	.....	16.50	16.00	.....
Nitrate of Soda .....	15.00	18.24	.....	.....	.....

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	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
F. S. Royster Guano Co., Baltimore, Md.—(Cont.)					
Royster's Fine Ground Bone Meal .....	2.47	3.00	22.90	.....	.....
Royster's Pure Raw Bone Meal .....	3.70	4.50	21.50	.....	.....
Royster's Royal Blue Ammoniated Superphosphate.	0.82	1.00	10.50	10.00	.....
Royster's Penguin Ammoniated Superphosphate...	1.65	2.00	10.50	10.00	.....
Royster's Flamingo Ammoniated Superphosphate...	2.06	2.50	12.50	12.00	.....
Royster's Curfew Ammoniated Superphosphate...	3.29	4.00	8.50	8.00	.....
Royster's Landmark Ammoniated Phosphate.....	3.29	4.00	10.50	10.00	.....
Royster's Good Will Ammoniated Superphosphate.	4.11	5.00	8.50	8.00	.....
Royster's Abundant Ammoniated Superphosphate.	4.11	5.00	10.50	10.00	.....
Royster's Cuckoo Crop Grower .....	0.82	1.00	8.50	8.00	1.00
Royster's Logical Compound .....	1.65	2.00	8.50	8.00	1.00
Royster's Old Faithful Phosphate .....	2.06	2.50	8.50	8.00	1.00
Royster's Safeguard Fertilizer .....	2.06	2.50	8.50	8.00	2.00
Royster's Drillwell Phosphate .....	2.47	3.00	8.50	8.00	1.00
Royster's Continental Fertilizer .....	2.47	3.00	8.50	8.00	2.00
Royster's Defender Fertilizer .....	3.29	4.00	8.50	8.00	1.00
Royster's Big Bet Fertilizer .....	3.29	4.00	8.50	8.00	2.00
Royster's Log Cabin Guano .....	4.11	5.00	8.50	8.00	1.00
Royster's Emergency Fertilizer .....	4.11	5.00	8.50	8.00	2.00
Ruckman Bros., New Brunswick, N. J.					
Five and Six Special .....	4.11	5.00	8.00	6.00	.....
Schanck, Hutchinson & Field, Hightstown, N. J.					
S. H. & F. Fish Mixture for Corn .....	1.64	2.00	8.00	7.00	.....
S. H. & F. Crop Compound for Corn .....	1.64	2.00	8.00	7.00	2.00
Scott Fertilizer Co., Elkton, Md.					
W. R. Hackett's Special Broadcaster .....	2.46	3.00	17.00	16.00	.....
W. R. Hackett's Special Potato Manure 1916....	4.94	6.00	12.00	11.00	.....
W. R. Hackett's Special Top Dresser .....	5.76	7.00	12.00	11.00	.....
Sea Board Utilization Co., Long Branch, N. J.					
Night Soil .....	1.15	1.40	2.64	.....	.....
Garbage Tankage .....	2.26	2.74	2.31	.....	.....
Harry L. Sickel, Woodbury, N. J.					
High Grade Tankage .....	5.76	7.00	3.50	.....	.....
High Grade Tankage .....	6.58	8.00	4.00	.....	.....
High Grade Tankage .....	8.23	10.00	5.00	.....	.....
Standard Guano Co., Baltimore, Md.					
Standard Extra High Grade .....	.....	.....	16.50	16.00	.....
Standard 10% Fish Tankage .....	8.20	10.00	.....	.....	.....
Standard Nitrate of Soda .....	12.30	15.00	.....	.....	.....
Standard Pure Bone Meal .....	2.46	3.00	22.00	.....	.....
Standard Fine Ground Raw Bone .....	3.28	4.00	22.00	.....	.....
Standard Canary Brand Cotton Seed Meal.....	5.74	7.00	1.50	1.00	1.00
Grange Commercial Store Standard South Jersey King .....	2.46	3.00	8.50	8.00	.....
Grange Commercial Store Standard Farmers' Favorite .....	2.46	3.00	10.50	10.00	.....

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	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
<b>Standard Guano Co., Baltimore, Md.—(Cont.)</b>					
Grange Commercial Store Standard Excelsior Guano .....	3.28	4.00	8.50	8.00	.....
Grange Commercial Store Standard Champion....	3.28	4.00	8.50	8.00	.....
Grange Commercial Store Standard Big Crop Grower .....	4.10	5.00	8.50	8.00	.....
Grange Commercial Store Standard Royal Gem...	4.10	5.00	10.50	10.00	.....
Grange Commercial Store Standard Keystone Brand .....	3.28	4.00	10.50	10.00	.....
Grange Commercial Store Standard Good Luck Grain and Grass Guano .....	1.64	2.00	8.50	8.00	2.00
Grange Commercial Store Standard Sure Crop...	3.28	4.00	8.50	8.00	2.00
Grange Commercial Store Standard Star Potato Grower .....	3.28	4.00	8.50	8.00	3.00
Grange Commercial Store Standard Royal Crop Grower .....	3.28	4.00	8.50	8.00	4.00
<b>Charles Stevens, Napanee, Ontario.</b>					
"Beaver Brand" Potash and Bone Fertilizer.....	.....	.....	2.00	.....	5.00
<b>Swift &amp; Co., Inc., Baltimore, Md.</b>					
Swift's Pure Tankage .....	8.23	10.00	.....	.....	.....
Swift's Pure Nitrate of Soda .....	14.81	18.00	.....	.....	.....
Swift's High Grade Acid Phosphate .....	.....	.....	16.00	16.00	.....
Swift's Pure Bone Meal .....	2.47	3.00	24.00	.....	.....
Swift's Pure Raw Bone Meal .....	3.70	4.50	23.00	.....	.....
Swift's Pure Corn and Grain Grower .....	0.82	1.00	7.00	7.00	.....
Swift's Pure Diamond C Grain Fertilizer .....	0.82	1.00	8.00	8.00	.....
Swift's Pure Jersey Sweet Potato Fertilizer .....	1.65	2.00	8.00	8.00	.....
Swift's Pure Special Corn Grower .....	1.65	2.00	10.00	10.00	.....
Swift's Pure Special Formula "A" .....	3.29	4.00	8.00	8.00	.....
Swift's Pure Jersey White Potato Fertilizer.....	3.29	4.00	8.00	8.00	.....
Swift's Pure Special Truck Mixture .....	3.29	4.00	8.00	8.00	.....
Swift's Pure Special Baltimore Formula .....	3.29	4.00	10.00	10.00	.....
Swift's Pure Special Pride of Jersey .....	4.11	5.00	8.00	8.00	.....
Swift's Pure Mammoth Potato Brand .....	4.11	5.00	10.00	10.00	.....
Swift's Pure Special Top Dresser .....	8.20	10.00	5.00	5.00	.....
Swift's Pure Reliable Grain Fertilizer .....	0.82	1.00	8.00	8.00	1.00
Swift's Pure Sweet Potato Special .....	1.65	2.00	8.00	8.00	1.00
Swift's Pure Special Formula .....	1.65	2.00	8.00	8.00	3.00
Swift's Pure Corn and Wheat Grower .....	1.65	2.00	10.00	10.00	2.00
Swift's Pure White Potato Special .....	3.29	4.00	8.00	8.00	1.00
Swift's Pure White Potato Special Formula No. 2.	3.29	4.00	8.00	8.00	2.00
Swift's Pure Baltimore Formula .....	3.29	4.00	10.00	10.00	1.00
<b>Swift &amp; Co., Kearny, N. J.</b>					
Kemp's Acid Phosphate .....	.....	.....	14.00	14.00	.....
Kemp's Grass and Grain Grower .....	1.65	2.00	10.00	10.00	.....
Kemp's Pulverized Sheep Manure .....	1.65	2.00	1.00	.....	1.50
Kemp's Corn and Truck Grower .....	1.65	2.00	9.00	9.00	1.00
Kemp's Special Potato Fertilizer .....	2.47	3.00	8.00	8.00	1.00

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	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
Swift & Co., Kearny, N. J.—(Cont.)					
Kemp's Market Garden Manure .....	2.47	3.00	9.00	9.00	1.00
Kemp's Potato Fertilizer .....	3.29	4.00	8.00	8.00	1.00
Swift's Pure Regal Diamond B Fertilizer.....	0.82	1.00	10.00	10.00	.....
Swift's Pure Regal Diamond A Fertilizer.....	2.47	3.00	10.00	10.00	.....
Swift's Pure Cranberry Grower .....	3.29	4.00	10.00	10.00	.....
Haines' Special Harrison Formula .....	3.29	4.00	10.00	10.00	.....
Haines' Special Pride of Jersey Fertilizer.....	4.11	5.00	8.00	8.00	.....
Holly Favorite .....	4.11	5.00	10.00	10.00	.....
Swift's Pure Long Island Favorite Fertilizer....	4.11	5.00	10.00	10.00	.....
Swift's Grain Fertilizer .....	0.82	1.00	8.00	8.00	2.00
Swift's Red Steer Fertilizer .....	1.65	2.00	8.00	8.00	2.00
Swift's Corn and Wheat Grower .....	1.65	2.00	10.00	10.00	2.00
Swift's Champion Wheat and Corn Grower .....	1.65	2.00	12.00	12.00	2.00
Swift's Grain Grower .....	2.47	3.00	8.00	8.00	2.00
Swift's Regal Strawberry Fertilizer .....	2.47	3.00	9.00	9.00	2.00
Swift's Pure Harrison Truck and Potato Manure.	3.29	4.00	10.00	10.00	2.00
Hill's All Crop Fertilizer .....	1.65	2.00	8.00	8.00	1.00
Taylor Bros., Camden, N. J.					
High Grade Potato Phosphate 1916 Revised.....	1.65	2.00	10.00	10.00	1.00
George F. Taylor Commission Co., New York City.					
Nitrate of Soda .....	15.00	.....	.....	.....	.....
Sulphate of Ammonia .....	20.00	.....	.....	.....	.....
Ground Raw Bone Meal .....	3.72	.....	23.00	.....	.....
Acid Phosphate .....	.....	.....	16.50	16.00	.....
Taylor Provision Co., Trenton, N. J.					
John Taylor's Standard Grain Grower Revised....	0.82	1.00	10.00	9.00	.....
John Taylor's P. D. B. Revised .....	1.64	2.00	10.00	9.00	.....
I. P. Thomas & Son Co., Philadelphia, Pa.					
Cyanamid .....	20.10	24.50	.....	.....	.....
Sulphate of Ammonia .....	20.50	25.00	.....	.....	.....
Animal Tankage .....	7.40	9.00	9.00	.....	.....
Crude Fish Mixture .....	3.70	4.50	9.50	9.00	.....
Thorofare Grange Sweet Potato Guano .....	1.65	2.00	10.50	10.00	.....
Thorofare Grange White Potato Guano .....	4.10	5.00	8.50	8.00	.....
Thorofare Grange Five Per Cent Guano .....	4.10	5.00	10.50	10.00	.....
Grain Special Fertilizer .....	0.82	1.00	8.50	8.00	2.00
Trenton Bone Fertilizer Co., Trenton, N. J.					
Special Mixtures in accordance with ruling of State Chemist.					
Dried Fish .....	8.20	10.00	.....	.....	.....
Borden's Fish Mixture .....	4.10	5.00	6.00	5.00	.....
F. W. Tunnell & Co., Inc., Philadelphia, Pa.					
Acid Phosphate .....	.....	.....	16.50	16.00	.....
King Crab .....	7.42	9.00	.....	.....	.....
10% Ground Fish .....	8.23	10.00	.....	.....	.....
Nitrate 15% .....	12.34	15.00	.....	.....	.....
Nitrate of Soda .....	14.81	18.00	.....	.....	.....
Bone Dust .....	1.64	2.00	13.50	.....	.....

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	Nitrogen	Nitrogen Equivalent to Ammonia	Total Phosphoric Acid	Available Phosphoric Acid	Water-Soluble Potash
F. W. Tunnell & Co., Inc., Philadelphia, Pa.—(Cont.)					
Fish and Tankage .....	3.71	4.50	6.00	.....	.....
8% Ground Fish .....	6.58	8.00	5.00	.....	.....
1916 Fall Manure .....	1.23	1.50	10.50	9.50	.....
B Brand for Sweet Potatoes .....	1.64	2.00	11.00	10.00	.....
1916 Corn Fertilizer .....	2.46	3.00	11.00	10.00	.....
1916 General Crop Grower .....	2.46	3.00	11.00	10.00	.....
1916 No. 1 Strawberry Top Dresser .....	3.30	4.00	11.00	10.00	.....
Potato and Fish Guano .....	4.12	5.00	6.75	5.75	.....
Grass Dresser .....	4.12	5.00	9.00	8.00	.....
1916 Special Top Dresser .....	4.12	5.00	9.00	8.00	.....
Fish and Bone .....	4.12	5.00	11.00	7.00	.....
Long Island Trucker .....	4.12	5.00	11.00	10.00	.....
Truckers' Fish Manure .....	4.31	5.25	7.00	6.00	.....
I X L Guano .....	4.94	6.00	11.00	10.00	.....
1916 Seven per cent Top Dresser .....	5.77	7.00	8.00	7.00	.....
Gloucester County Potato Manure .....	3.30	4.00	8.00	7.00	1.00
1916 Climax Potato Manure .....	4.12	5.00	9.00	8.00	1.00
J. E. Tygert Co., Philadelphia, Pa.					
Tygert's 5-10-0 Fertilizer .....	4.11	5.00	11.00	10.00	.....
J. Wenderoth & Sons, Camden, N. J.					
Ground Bone .....	2.46	3.00	18.00	.....	.....
Acid Phosphate .....	.....	.....	16.00	15.00	.....
West Jersey Marl & Transportation Co., Woodbury, N. J.					
Special Mixture No. 2 .....	3.30	4.00	8.00	8.00	.....
Special Mixture No. 1 .....	4.12	5.00	10.00	10.00	.....
William Wilde, Vineland, N. J.					
Ground Bone .....	2.49	3.00	.....	.....	.....
Nitrate of Soda .....	15.00	18.50	.....	.....	.....
Sulphate of Ammonia .....	20.00	25.00	.....	.....	.....
Acid Phosphate .....	.....	.....	15.00	14.00	.....
Wilde's General Crop .....	2.49	3.00	9.00	8.00	.....
Wilde's Medium Grade Sweet Potato .....	1.67	2.00	9.00	8.00	3.00
Wilde's Enterprise White Potato .....	3.27	4.00	9.00	8.00	2.00
Woodward & Dickerson, Philadelphia, Pa.					
"BFC" Tankage .....	8.23	10.00	.....	.....	.....
Ground Blood .....	14.00	17.00	.....	.....	.....
Acid Phosphate .....	.....	.....	15.50	15.00	.....
Abbott Worthley Co., Marlboro, N. J.					
Worthley's Jersey Potato Fertilizer .....	3.29	4.00	10.00	10.00	.....
Worthley's Jersey Potato Manure .....	4.12	5.00	10.00	10.00	.....
Jacob R. Wyckoff, Princeton Junction, N. J.					
Wyckoff's Degelatinized Bone .....	0.82	1.00	28.00	28.00	.....
Wyckoff's Standard Grain Manure .....	1.65	2.00	8.00	8.00	.....
Wyckoff's Wheat and Rye Manure .....	1.65	2.00	10.00	10.00	.....
Wyckoff's Bone Mixture .....	1.65	2.00	16.00	16.00	.....









**PRESERVATION REVIEW**

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